

Historic, Archive Document

Do not assume content reflects current
scientific knowledge, policies, or practices.

025076
A1054
C.2



United States
Department
of Agriculture

National
Agricultural
Library

Bibliographies
and Literature
of Agriculture
Number 90



National Oceanic
and Atmospheric
Administration



October 1989

The Potentials of Aquaculture:

An Overview and Bibliography





United States
Department
of Agriculture

National
Agricultural
Library

Bibliographies
and Literature
of Agriculture
Number 90



National Oceanic
and Atmospheric
Administration



October 1989

The Potentials of Aquaculture:

An Overview and Bibliography

Deborah T. Hanfman,
National Aquaculture Library,
Aquaculture Information Center

Steven Tibbitt,
National Oceanic and Atmospheric
Administration; National Environmental
Satellite, Data, and Information Service (NESDIS)

Carol Watts,
National Oceanic and Atmospheric
Administration; National Environmental
Satellite, Data, and Information Service (NESDIS)

Beltsville, Maryland
National Agricultural Library
1989

Preface

This bibliography contains “selected” citations from the literature on the world potentials of aquaculture. Citations date from approximately 1976 to the present, and are arranged alphabetically by the author’s surname. An author index as well as a subject index to aquaculture terms (selected from the title, abstract, and descriptor fields) are provided at the end of the bibliography.

A narrative overview of the history, current status, and future outlook of aquaculture in the United States and the world is provided at the beginning of the paper. Many resources on these topics were consulted for accuracy of data and textual content and are listed in the bibliography. In addition, a peer review of the narrative was provided by the Economic Research Service, U.S. Department of Agriculture and the National Marine Fisheries Service, (NMFS), of the National Oceanic and Atmospheric Administration (NOAA), U.S. Department of Commerce. Any controversial statistics related to current or future aquaculture data may be a result of previously printed statistics found in the literature.

Several computerized databases were searched for citations to the literature. As a result of utilizing different databases to compile this bibliography, formats for the bibliographic entries may vary.

Databases accessed for relevant information include: 1) ASFA (Aquatic Sciences and Fisheries Abstracts) database, 1978-present, produced under contract to the Food and Agriculture Organization of the United Nations by Cambridge Scientific Abstracts (CSA) for a consortium of United Nations agencies and cooperating member states; and 2) AGRICOLA (AGRICultural OnLine Access), an agricultural database produced by the National Agricultural Library (NAL), 1979-present. In addition, a limited number of selected books and articles not found in these databases were included in the bibliography.

FOR INFORMATION REGARDING LENDING SERVICES, please consult the information sheet in this publication entitled “Availability of Cited Documents.”

Acknowledgments

This bibliography represents a cooperative effort between the Aquaculture Information Center of the National Agricultural Library (NAL) and the National Environmental Satellite, Data, and Information Service (NESDIS) of the National Oceanic and Atmospheric Administration (NOAA). NAL acknowledges the collaborative and funding support provided by NOAA to compile and publish this bibliography.

Special appreciation is expressed to Mike Dicks of the Economic Research Service (ERS), U.S. Department of Agriculture and to Ben Drucker of the National Marine Fisheries Service (NMFS), NOAA, U.S. Department of Commerce. Their review of the narrative describing the U.S. and world status of aquaculture ensured the accuracy of data and overall quality of the publication.

DEBORAH T. HANFMAN
COORDINATOR
AQUACULTURE INFORMATION CENTER
NATIONAL AGRICULTURAL LIBRARY
ROOM 304
BELTSVILLE, MARYLAND 20705

Availability of Cited Documents

Non-USDA Patrons

The materials listed in this bibliography are available on interlibrary loan through your local library. The librarian in your public, State, university or corporate library can assist you in obtaining materials either in your area or directly from the National Agricultural Library. Current charges are:

Photocopies:	\$5 for the first 10 pages \$3 for each additional 10 pages
Microfiche:	\$5 for the first fiche \$0.50 for each additional fiche
Microfilm:	\$10 per NAL-owned reel of microfilm

Invoices are issued quarterly. Requests must comply with the National or International Interlibrary Loan Code. Questions about the availability of these materials may be directed to:

Lending Branch
National Agricultural Library
10301 Baltimore Boulevard
Beltsville, MD 20705
(301) 344-3755

USDA Patrons

The materials listed in this bibliography may be obtained by submitting one Form AD-245 for each item requested to your local Agency or Regional Document Delivery System Library or directly to the address above.

THE POTENTIALS OF AQUACULTURE: AN OVERVIEW AND BIBLIOGRAPHY

Introduction

This series of Bibliographies and Literature of Agriculture is intended to provide readers with an overview of available literature on the potential of world aquaculture. It offers citations to selected books, articles, reports, and news items that were identified in online bibliographic databases. Coverage includes literature on feasibility studies, production potential of species of aquatic animals and plants, site selection, statistics, and the feasibility of introducing new aquaculture techniques in a particular region.

Historical Background

Aquaculture or the farming of aquatic animals and plants was practiced prior to 2000 B.C. by the Japanese, Chinese, Romans, Egyptians, and Mayan Indians of South America. Fish ponds are depicted in ancient Egyptian bas-reliefs, while the first recorded Chinese references date to over 3,000 years ago. The first book on aquaculture was said to have been written around 500 B.C. These peoples of various cultures constructed ponds and farmed fish for food and recreation much in the same manner as we do today.

Of all the fish species utilized by man, the common carp has one of the longest histories of culture abroad. Around 475 B.C., spawning of captive carp in China was discussed and advocated as a profitable business. Aristotle mentions carp and it is likely that both the Greeks and Romans fattened these fish in ponds. In addition to carp, a type of oyster culture became common in the Mediterranean during the period of Roman dominance.

Further introductions of carp culture in Europe may have taken place around A.D. 1150. In Austria the history of carp culture goes back to A.D. 1227. By 1860, the species was raised in most European countries along with other freshwater fish species. The first marine hatchery was established in 1884 in Norway to aid the cod fisheries.

Aquaculture is apparently not indigenous to the United States. There is no evidence that fish culture was practiced in the pre-Columbus era. Trout-farming is considered the oldest farming industry in the United States and began originally in the 1800's as a way to replenish wild stock in streams and lakes. Salmon hatcheries date back as much as 100 years. However, most commercial production of aquaculture for food and nonfood sources has occurred during the last 30 years.

The first commercial sale of catfish was in 1960 in Arkansas. Brood stock were obtained from the Mississippi River, and the fish were raised in ponds originally built for buffalo fish production. About the same time in Alabama a grocery store owner began to process and sell catfish he previously stocked in a small pond (less than one hectare). Following these modest beginnings, individuals in Mississippi became interested in catfish production as an alternative crop to the more traditional crops in the Delta area. Today, Mississippi dominates the industry, with Alabama, Arkansas, California, and Louisiana following in production. This trend will possibly continue based on State differences in the average-size farm. According to the Economic Research Service, U.S. Department of Agriculture, the average catfish operation is 255 acres in Mississippi, while in Arkansas the farm is only 91 acres.

Currently, we see aquaculture as a rapidly expanding industry resulting from new interest in alternative agriculture crops, creation of new jobs, and dietary health. Aquaculture can be seen as a benefit to producers, consumers, and the economy.

Status of Aquaculture in the United States

Today, American aquaculture is the fastest growing agricultural industry in the United States. Much of the expansion is driven by an increased demand for fisheries products and reduced yields from traditional fisheries landings. A column in the June 1989 issue of SFI (Sport Fishing Institute) Bulletin states, "Every species of food finfish in the United States' marine waters is now fished at or above its capacity to replace itself."

In 1988, total U.S. production of edible and nonedible aquaculture products was approximately **790 million pounds** with a farm gate value of \$600 million. Resulting from this, both U.S. and foreign consumers are provided with food, recreation, clothing, vitamins and minerals, and products used for commercial purposes.

Seafood consumption in general has increased 25 percent from 1982 to 1987 and focused on fresh and frozen seafoods versus canned and cured (salted, pickled, dried) fishery products. In 1987, 14 percent of the U.S. seafood consumption was from aquaculture products.

About one-half of the U.S. aquaculture is **catfish**, but over 20 species are cultured in the Nation today. In 1988, approximately **295 million pounds** of catfish were processed. **Crawfish, trout, and salmon** production (well-established aquaculture industries) follow next. The above four species account for almost 80 percent of the U.S. aquacultural output. Other aquacultural species such as **tilapia** and **striped bass** demonstrated increased production in 1988.

In volume, **catfish, crawfish, and salmon** are the fastest growing of the developed aquacultural industries. In monetary value, **catfish, trout, and baitfish** are the top three industries. In 1987, catfish production was worth over \$275 million, with baitfish \$70 million and trout \$60 million.

Catfish. Most of the growth in U.S. aquaculture production has come from the catfish industry. 60 percent of the growth of this industry is from increased acreage. 40 percent is attributed to higher stocking rates and better feed conversion. New production technologies such as net-pen culture, recirculating systems, genetic improvement, and control of diseases and off-flavor will continue to promote industrial growth.

Crawfish. Crawfish are found naturally throughout the continental United States, but are currently produced for commercial consumption in seven states (Louisiana, Texas, Mississippi, California, Oregon, South Carolina, Maryland). Louisiana dominates U.S. crawfish production of the red swamp crawfish (*Procambarus clarkii*) and the white river crawfish (*Procambarus acutus acutus*). The two major outlets for crawfish are the consumer market and the fish bait market. In 1987, crawfish production was estimated at **95 million pounds**. Including the wild harvest, Louisiana produces approximately 120 million pounds (80 percent of the world's supply) each year, with a value of more than \$70 million.

Trout. Rainbow trout is grown predominantly by private growers, although commercial operations that produce trout for use in recreational fishing may grow cutthroat, brown, steelhead, and other trout species. Most trout production is in Idaho, with North Carolina next in production with 7 million pounds. Smaller production facilities are scattered in other Western States and the Appalachian Mountains from New York to Georgia. Other trout species are being grown in Federal and State hatcheries.

Trout producers surveyed in the United States over a 1-year period beginning Fall 1987 sold a total of **58.9 million pounds** of trout for a farm gate value of \$63.6 million.

Salmon. Salmon faces strong competition from domestic wild catch as well as foreign wild catch and aquaculture. Wild catch species include: chinook, sockeye, coho, chum, and pink salmon. Aquaculturally grown salmon are primarily Atlantic and coho, with some chinook also being farm-raised.

Accurate data on current U.S. aquaculture of salmon is unavailable. However, in 1984, 16,602 tonnes of farmed and ranched salmon were produced, with only 1,814 tonnes of the total being farmed salmon. In 1988, 6 million pounds of salmon were privately raised. Atlantic salmon and chinook are reared to a harvesting size of 6 to 10 pounds and processed into a number of different cuts. Coho, a smaller fish, is normally sold as gutted whole fish. Steelhead trout, sometimes marketed as "salmon trout" compete in the salmon market.

Salmon-farming in the United States is concentrated in Washington, Oregon, California, and, most recently, Maine. In general, the United States currently imports more than 60 percent of all fish consumed from 126 different countries, which results in a trade deficit of over \$6.5 billion. In 1987, Canada was ranked as the number one supplier of edible U.S. seafood, with Mexico, Ecuador, Taiwan, and Japan following. Increased domestic aquaculture production will contribute to reducing the national trade imbalance. Integrated with other onfarm production, it will allow producers to diversify and increase total farm profitability.

Outlook for the United States

The importance of aquaculture has increased dramatically in the United States. Production of edible and nonedible products is growing fast with the trend expected to continue. Consumption of seafood is predicted to increase from 15 pounds per year per person to 25 pounds during the year 2000. Changing consumer preferences could be the overriding factor in the future growth of aquaculture. As a result, aquaculture production could reach **2-3 billion pounds** by the year 2000.

Catfish, salmon, trout, crawfish, and striped bass could provide the greatest growth share of output. By the year 2000, commercial catfish production could increase to **126 billion pounds**. New facilities should increase catfish output by 3-5 percent, if the industry infrastructure expands in other States in addition to the Mississippi.

Crawfish production could double if aggressive marketing increases consumption outside Louisiana. Salmon output could double with the provision of new production sites. National public acceptance of salmon is excellent and wild catch may soon reach a maximum sustainable level. Trout production may increase 25 percent with the advent of genetically superior fish.

The Economic Research Service, U.S. Department of Agriculture, predicts that shellfish culture will increasingly substitute for wild harvest. Striped bass has a ready market and is likely to be the fastest growing aquacultural product with output by 2000, exceeding **100 million pounds**. In addition, to become a part of the U.S. diet, species such as tilapia and perch will require aggressive marketing and promotion.

Overall, we see a rapid expansion continuing in the United States as a result of changing consumer preferences, aggressive marketing, increasing household incomes, and alternative farming practices. Consumers are likely to have more confidence in grain-fed species than those from wild harvest.

With adequate resources such as high-quality water, good marketing practices, aquaculture management, land availability, new production technologies, and genetic improvement, the future of aquaculture in the United States looks bright.

Status of Aquaculture Worldwide

Aquaculture continues to grow in economic importance throughout the world by filling the gap between supply and demand for fisheries products. Consumers are benefited by improved nutrition and health and increased employment in economically depressed coastal and remote regions, and farmers are provided with alternative sources of income. The expansion in world fish and shellfish production is creating a dynamic new international area for feed, pharmaceutical, chemical, and other companies.

In 1985, a world estimate of aquaculture production of finfish, molluscs, crustaceans, and seaweeds was 10,587,300 tonnes. This estimate was calculated by the Food and Agriculture Organization (FAO) from supplied data resources.

Today, aquaculture produces over 10.9 million tonnes, of which 8.2 million tonnes are fish and shellfish. Seaweeds and algae represent the remainder of aquaculture species and are used for human consumption as well as pharmaceutical purposes.

According to FAO statistics for 1986, China was the highest producer of finfish, crustaceans, mollusks, and seaweeds, followed by Japan, the Republic of Korea, the Philippines, and the United States. Asia is by far the cradle of aquaculture, accounting for much of the world's production of both fish and aquatic plants, with more than 9 million tonnes produced in 1986 of the total 11 million tonnes produced globally.

FAO statistics gathered for 1986 show carp as the most important species produced worldwide, followed by tilapia, channel catfish, rainbow trout, and salmon.

Salmon production is soaring at fish farms worldwide. Norway, the United Kingdom, and Japan are the world's leading salmon-farming nations. In 1986, these three countries produced approximately 85 percent of the world's farmed salmon. The industry is primarily based on the Atlantic salmon species. In 1988, Norway, the top producer of salmon, raised approximately 160 million pounds.

Asia. Asia is the most important region for aquaculture worldwide. About 81 percent of the total production comes from Asia. Of its 24 countries, 20 practice aquaculture and have established and active sectors. China, Japan, the Republic of Korea, and the Philippines are the four leading producers of the world, with carp and seaweed dominating production. Asian aquaculture ranges from traditional extensive to intensive systems. Practices include aquaculture in earthen ponds, including the use of floating cages, net pens, and other enclosures. Floating rafts, lines, and stakes are used for mollusc and seaweed production. Countries in Asia utilize a mixture of both low and high levels of technology with traditional techniques.

Europe. The main aquaculture products in Europe are the European carp, mussels, rainbow trout, and oysters. In 1985, total production of these four species was more than 900,000 tonnes in 1985, which was 94 percent of the total European production.

France is the number one producer of farmed trout in Europe, followed by Denmark, Italy, and West Germany. France is also the European leader of oyster production. Mussel culture is prominent in The Netherlands, Spain, and France.

Latin America. Although there is increasing interest in aquaculture in Latin America, aquaculture production except for shrimp remains quite small. Some of the highest meat consumers in the world are in the Latin American region. Despite encouragement of fish consumption by several countries, FAO indicates that over the past two decades, the share of fish in the per capita consumption of animal protein has remained at about 8 percent--about two-thirds of the world average. The region is a net exporter of fish products. Crustaceans and mollusks are exported fresh or frozen to earn foreign exchange. Low-value species are used mainly for animal feeds or fishmeal. According to the FAO, the Latin American region now has about 4 percent of the world market for marine shrimp.

Africa. There is a strong interest in Africa to develop aquaculture, with good potential of land and water resources. The primary culture has been of tilapias and the common carp. However, over 26 species are farmed in African countries, with the majority of them being freshwater species.

World Outlook

Based on recent trends in regional aquaculture growth over the past decade, world production may reach 22 million tonnes by the end of the century. Aquaculture could account for 25 percent by weight of total world fisheries production (capture fisheries plus aquaculture).

Over the next decade, ocean-ranching of salmon will become only a small part of the aquacultural salmon industry. By 1990, Norway, the top producer of salmon, could farm as much as 220 million pounds of Atlantic salmon. Other countries expected to rapidly expand their pen-farmed salmon industries are Chile, Canada, Ireland, Iceland, and the Faroe Islands.

Africa will continue to receive assistance on integrated aquaculture development. Asia and the Pacific will focus on marketing studies, improved production methods, postharvest handling, and processing. Latin America and the Caribbean will promote shrimp, tilapia, and other species by small-scale producers. The Mediterranean will focus on producing high-value marine species for the tourist trade and export in the future; of the 50 or more species currently farmed, most are freshwater or brackishwater fishes, such as salmonids and carps.

By the year 2000, one-quarter of the world's consumption of seafood is predicted to come from fish farms. From the above overview of the industry, it is obvious that there is considerable aquaculture production in many countries of the world. The potential for future developments in all countries, whether coastal or landlocked, is very high. Maximized production of edible and nonedible aquatic foods will be achieved through increased consumer interest and with the aid of a consortium of government, scientific, and industry-supported research and development programs.

Bibliography

1

Cage culture of marine fish in east coast Peninsular Malaysia. A report on an assessment of the feasibility of introducing cage culture of marine fish to Pulau Perhentian Besar and Kuala Setiu Lagoon on east coast of Peninsular Malaysia.

[anonymous]

Source: Department of Agriculture and Fisheries, Hong Kong Ministry of Agriculture and Land Reform, Kuala Lumpur, February 1978, 83 pp.

Languages: English

Document Type: Numerical Data; Report

ASFA Number: 109-14181

Abstract:

Cage culture of marine fish was initially identified as a possible activity to provide employment for poor fishermen at the Kuala Besut Small-Scale Fisheries Development pilot site, Kuala Besut, Trengganu, Malaysia. This work describes the preliminary hydrographic and biological surveys made to determine the feasibility of starting a pilot cage culture project in the area. A plan of work was drafted and actual implementation was started. Activities included the collection of suitable fish for stocking the demonstration cages, the construction of cages using designs found successful in other areas and rearing of selected species of fish in the cages. This work is continuing and future plans have been formulated. Environmental conditions and results of the trial culture operations are being monitored. Training of local counterpart staff and fish farmers is described.

Environment: Marine; Brackish

Identifiers: fishery development; fishermen

2

National Fishing Week and SFI events.

[anonymous]

Source: SFI Bulletin, (405), June 1989, pp. 1-3.

Languages: English

Document Type: Newsletter

3

Potential for coastal aquaculture development. Sri Lanka.

[anonymous]

Source: Department Fish., Bangkok (Thailand), 1979, 19 pp.

Languages: English

Document Type: Book

Report No.: RAS/77/044/WP/25

ASFA Number: 112-11689

Abstract:

This report is the result of a survey undertaken during in October/November 1978, by a team of officers from the Brackish water Fisheries Division, Department of Fisheries, Thailand, for the purpose of: exploring the possibilities of brackish water aquaculture development in Sri Lanka as to location,

Abstract (cont.):

suitable species and culture techniques outlining the requirements for the establishment of a development station for seed production and culture experiment and demonstration with specification of physical facilities and staff training and identifying components such as technical advice and training which might be available from Thailand or other countries in the region, for aquaculture development in Sri Lanka. This report presents a summary of the observations made on the various fishery stations and potential aquaculture sites visited. The major findings are presented and recommendations are given for a plan of development.

Descriptors: aquaculture development; brackish water aquaculture; fish culture; crustacean culture; aquaculture techniques; seed production

Geographic Descriptors: ISW, Sri Lanka

Environment: Brackish

4

Farming's new frontier.

Annett, William

Source: VENTURE, March 1989, pp. 35-40.

Languages: English

Document Type: Journal Article

5

ADCP aquaculture minutes.

Source: Aquaculture Development and Coordination Programme, Fisheries Department, FAO of the United Nations, Via delle Terme di Caracalla, Rome 00100, Italy. [Summaries of Aquaculture Development and Coordination in Various Regions], (4), June 1989, 18 pp.

Languages: English

Document Type: Newsletter

6

Production potential of freshwater aquaculture in West Malaysia.

Arshad, N.B.

(Department of Agricultural and Resource Economics, National University of Malaysia, Malaysia)

Librero, A.R.; Collier, W.L. [eds.]

Source: 2. Bienn. Meet. of the Agricultural Economics Society of Southeast Asia, Tigbauan (Philippines), November 3-6, 1977. ECONOMICS OF AQUACULTURE, SEA-FISHING AND COASTAL RESOURCE USE IN ASIA. PROCEEDINGS OF THE SECOND BIENNIAL MEETING OF THE AGRICULTURAL ECONOMICS SOCIETY OF SOUTHEAST ASIA, NOVEMBER 3-6, 1977, TIGBAUAN, ILOILO, PHILIPPINES. 1979, pp. 61-69.

Languages: English

Document Type: Conference; Book

ASFA Number: 113-14868

Abstract:

The present status of freshwater aquaculture in Malaysia is discussed. The potential for further development of the industry in the country is evaluated. It is concluded that further increases in production must be accompanied by an improvement in management practices and methods of fish cultivation which have been neglected by many fish farmers during the past few years.

Descriptors: freshwater aquaculture; aquaculture development
Geographic Descriptors: Malaysia
Environment: Fresh

7

Etat actuel et possibilite de developpement de l'aquaculture en Tunisie.

(State and Development Potential of Aquaculture in Tunisia).

Azzouz, A.

(Laboratoire Biologie Halieutique, Institut Nationale Agronomique, 43 Avenue de Charles Nicolle, Tunis, Tunisie)

Source: BULLETIN OFFICIALE NATIONALE DE PECHE (TUNISIA), (1980), vol. 4 (2), pp. 201-208.

Languages: French

Summary Languages: English; French

Document Type: Journal Article

ASFA Number: 112-01301

Abstract:

Fish-farming has developed in Tunisia (lakes, ponds, etc...) since 1965, because of its socioeconomic importance, principally by utilization of noncultivated areas and high salted springs which cannot be used by agriculture.

Descriptors: fish culture; aquaculture development; lakes; stocking (organisms)

Geographic Descriptors: Tunisia

Environment: Fresh

8

Congo. Etude de faisabilite sur la creation au centre national de la Djoumouna d'une unite pilote de demonstration pour la production commerciale intensive de tilapia. Un rapport prepare pour le projet Developpement de la pisciculture.

(Congo. feasibility study on the creation, at the National Centre of Djoumouna, of a pilot demonstration unit for intensive commercial tilapia culture.)

Balarin, J.D.

Source: FAO, ROME (ITALY), 1983, 85 pp.

Languages: French

Report No.: FAO FI/DP/PRC/79/007/Doc-Travail-2.

Document Type: Numerical Data; Report

ASFA Number: 115-04642

Abstract:

An account is given of a pilot study carried out regarding intensive culture of tilapia in the People's Republic of the Congo, also giving description of the geography and climate, infrastructure, demography, agricultural development and nutrition of the country, its aquatic resources and the current state of aquaculture. The project is described in detail, outlining the site chosen for the study, strategies and technical details involved in the operation of the center.

Descriptors: aquaculture development; fish culture

Geographic Descriptors: Congo, People's Rep.

Taxonomic Descriptors: Tilapia

Environment: Fresh

Report to the Government of Saudi Arabia. Tilapia mariculture in Saudi Arabia: A feasibility study and detail plan for the development of a baobab tilapia culture facility at the Fish Farming Centre, Jeddah. A report prepared for the Fish Farming Centre Project.

Balarin, J.D.

Source: FAO, ROME (ITALY), 1983, 98 pp.

Languages: English

Document Type: Numerical Data; Book

Report No.: FAO/UTFN/SAU/010/SAU

ASFA Number: 115-04668

Abstract:

The Government of the Kingdom of Saudi Arabia, concerned about the country's dependence on imported fish products, has considered assisting in the development of a fish farm industry. The Third Five-year National Plan for Fisheries Development (1979-1984) allowed for the construction of a Fish Farm Centre to test various fish farm systems approaches. Included in the plan was a Baobab Tilapia Culture Facility. This mission sought to assist the Government by appraising the viability of such a system and the preparation of tender documents for the system. Technically it is feasible that tilapia can be grown in seawater. Production may be affected but not so adversely as to not permit an economic growth period to table size. It is proposed that tilapia be tested in all system types available at the Fish Farm Centre: ponds, tanks, raceways and cages. The tank system, for purposes of comparison, is a direct copy of Baobab Farm, Kenya.

Descriptors: fish culture

Geographic Descriptors: aquaculture development; Saudi Arabia

Taxonomic Descriptors: tilapia

Environment: Fresh

10

Potential of new strains of marine and inland saline-adapted microalgae for aquaculture.

Barclay, W.R.; Terry, K.L.; Nagle, N.J.; Weissman, J.C.; Goebel, R.P.

(Solar Energy Res. Inst., Golden, CO 80401 USA)

Source: J. WORLD AQUACULTURE SOC., (1987), vol. 18 (4), pp. 218-228.

Languages: English

Document Type: Journal Article

ASFA Number: 118-18120; 1818120

Abstract:

Through a collection and screening program aimed at isolating microalgae tolerant to high light, high salinity, and high temperature, several new strains with enhanced production potential (30-35 g/m²/d) were isolated. The overall range of environmental tolerance exhibited by these strains may result in enhanced culture stability, leading to the high production rates. The estimated costs of producing strains with these high production rates range from \$1.18 to \$1.71 per kg (unharvested), depending on the size of the production system. Total production costs for harvested algae (15% solids algal cell paste) range from \$1.63 to \$2.45 per kg. The major costs for producing harvested algae include the cost of CO₂, as well as capital and operating costs for the harvesting systems.

Descriptors: photoplankton culture; algal culture; aquaculture systems; aquaculture economics

Environment: Marine

11

Disponibilite a des fins d'aquaculture des differents ages de thon rouge en Atlantique Est.

Availability for aquaculture of different age groups of bluefin tuna in eastern Atlantic.

Bard, F.X.

(CNEXO, COB, BP 337 - 29273 Brest Cedex)

Source: Presented at: Working Group on Biology, Fisheries, and Potential Aquaculture of Mediterranean Tunas, Sete (France), 8 May 1979. LE THON ROUGE EN MEDITERRANEE. BIOLOGIE PECHE ET AQUACULTURE, CNEXO PARIS (FRANCE), 1979, pp. 127-133.

Languages: French

Summary Languages: English; French

Document Type: Conference; Book

ASFA Number: 110-06594

Abstract:

Main conclusions on the availability of bluefin tuna in the Eastern Atlantic are given, using results of the International Commission for Conservation of Atlantic Tuna.

Taxonomic Descriptors: Scombrus thynnus

Environment: Marine

Identifiers: resource availability; MED; ANE; ASE; Thunnidae; Osteichthyes; Pisces

12

Les potentialites geographiques et techniques du littoral languedocien pour l'aquaculture des thons.

Geographical and technical potentiality of the Languedoc littoral zone for tuna aquaculture.

Barnabe, G.

(Stn. Biol. Mar. et Lagunaire, Quai de Bosc prolonge, 34200 Sete, France)

Source: Presented at: Working Group on Biology, Fisheries, and Potential Aquaculture of Mediterranean Tunas, Sete (France), 9 May 1979. LE THON ROUGE EN MEDITERRANEE. BIOLOGIE PECHE ET AQUACULTURE, CNEXO PARIS (FRANCE), 1979, pp. 203-207.

Languages: French

Summary Languages: English; French

Document Type: Conference; Book

ASFA Number: 110-05127

Abstract:

On Languedoc shore, several hatcheries may be used at the research and development level, to solve tuna aquaculture problems. Thus, incubation and hatching of air-transported eggs collected on spawning ground with different techniques are possible. Natural zooplankton now used to feed bass larvae in Sete is to be used for tuna rearing.

Geographic Descriptors: MED, France, Languedoc-Roussillon

Taxonomic Descriptors: Thunnus thynnus

Environment: Marine

Identifiers: littoral zone; zooplankton

13

North American sturgeons: Biology and aquaculture potential.

Binkowski, F.P.; Doroshov, S.I. [eds.]

(Cent. Great Lakes Stud., Univ. Wisconsin-Milwaukee, Milwaukee, WI 53201, USA)

Source: Symposium on the Biology and Management of Sturgeon. Presented at 113 Annual Meeting of the American Fisheries Society, Milwaukee, WI (USA), 16 August 1983. ENVIRONMENTAL BIOLOGY OF FISHES, 1985, vol. 14 (1), pp. 3-96.

Languages: English

Document Type: Conference; Book

ISSN: 0378-1909

ASFA Number: 116-02440

Abstract:

The symposium on the "Biology and Management of Sturgeon" included 22 papers which covered an amazingly broad spectrum of subjects. Six of the seven major sturgeon species found in North America were covered and a number of European and Asian species were also mentioned. The subjects included reproduction, physiology, taxonomy, genetics, growth, life history, population dynamics, culture and management. Papers were presented by fishery scientists from the coasts of the Atlantic, Pacific and Gulf of Mexico as well as the Great lakes and the Missouri River basin.

Descriptors: biology; fishery management; aquaculture development; conferences

Geographic Descriptors: North America

Taxonomic Descriptors: Acipenseridae

Environment: Marine; Fresh

14

North American sturgeons: Biology and aquaculture potential.

Binkowski, F.P.; Doroshov, S.I.

Source: Symposium on the Biology and Management of Sturgeon. Presented at 113 Annual Meeting of the American Fisheries Soc. Milwaukee, WI (USA), 16-20 August 1983. DEV. ENVIRON. BIOL. FISH., no. 6. DR W. JUNK, DORDRECHT (NETHERLANDS), 1985, 163 pp.

Languages: English

Price: \$63.50.

Document Type: Conference; Book

ISBN: 90-6193-539-3

ASFA Number: 117-05873

Abstract:

This monograph was reprinted from Environmental Biology of Fishes, 14(1), 1985, with the addition of six more papers from the symposium and an epilog on sturgeon culture. The selection of papers includes genetics, reproductive physiology, taxonomy, culture, behavior, development ecology, and management of sturgeon.

Descriptors: fish physiology; fish culture; sexual reproduction; genetics; ecology; behavior; conferences

Taxonomic Descriptors: Acipenser; Scaphirhynchus

Environment: Marine; Fresh

15

The Norwegian aquaculture industry: industrial structure and cost of production.

Bjoerndal, T.

(Inst. Fish. Econ., Norweigan Sch. Econ. and Business Adm., Helleveien 30, N-5035 Bergen-Sandviken, Norway.)

Source: MAR. POLICY., (1988), vol. 12 (2), pp. 122-142.

Languages: English

Document Type: Journal Article

ASFA Number: 119-04243

Abstract:

This article presents an overview of the development of Norwegian salmon aquaculture industry. The effects of government regulations on industry structure and development are analyzed. Examples of production planning for individual smolt producers and fish farmers are presented, and cost of production is analysed. Production forecasts indicate that there will be substantial further growth in the industry in the coming years, both in Norway and other countries such as Scotland, Canada and Chile. The increased competition this will cause and the ensuing pressure on salmon markets are discussed.

Descriptors: fish culture, aquaculture economics

Geographic Descriptors: ANE, Norway

Taxonomic Descriptors: Salmonidae

Environment: Marine

16

Fish farm output "could double".

Bloom, B.

Source: Financial Times: Commodities and Agriculture, June 14, 1989, p. 38.

Languages: English

Document Type: Newspaper Article

Descriptors: fish production

17

Catfish production leads growth in U.S. aquaculture.

Brown, R.H.

Source: Feedstuffs, May 30, 1988, vol. 60 (22), p. 10

Languages: English

Document Type: Newspaper Article

Descriptors: trends; statistics; projections; aquaculture; fish; fisheries; catfish; seafood; shellfish

Geographic Descriptors: United States

Environment: Fresh; Marine

18

Aquaculture -- views of the commercial fishing industry.

Bryan, D.

(Queensland Commercial Fishermen's Organ., Qld., Australia)

Pollock, B.R.; Quinn, R.H. [eds.]

Source: Seminar on the Potential of Aquaculture in Queensland, Brisbane (Australia), 24-25 March 1983.
CONF. WORKSHOP SER. DEP. PRIMARY IND. (QUEENSL.), no. QC83012. THE POTENTIAL OF
AQUACULTURE IN QUEENSLAND. PROCEEDINGS OF THE SEMINAR HELD AT THE
PROFESSIONAL DEVELOPMENT CENTRE, BRISBANE, 24-25 MARCH 1983. 1984, pp. 211-213.

Languages: English

Document Type: Conference; Book

ASFA Number: 115-18071

Abstract:

Aquaculture has the potential to provide a major increase in production of fish products with a high market value. Whilst the economic operation of aquaculture projects in Queensland remains uncertain, there is a necessity nonetheless to include consideration of the socioeconomic effects of this type of project on market opportunities for existing fisheries. The likely effects of habitat disturbance and loss of areas essential to fisheries similarly forms an integral part of any decision on this issue. The views of the fishing industry are therefore an essential prerequisite to any assessment of the environmental impact of aquaculture proposals: the present paper summarizes some of the problems and future prospects for the industry.

Descriptors: aquaculture development; environmental impact

Geographic Descriptors: Australia, Queensland

19

The ABC of aquaculture from algae to crayfish to shellfish: An adventure or business.

Campbell, G.

(Fish. Res. Branch, Dep. Primary Ind., Brisbane, Qld., Australia)

Pollock, B.R.; Quinn, R.H. [eds.]

Source: Seminar on the Potential of Aquaculture in Queensland, Brisbane (Australia), 24-25 March 1983.
CONF. WORKSHOP SER. DEP. PRIMARY IND. (QUEENSL.), no. QC83012. THE POTENTIAL OF
AQUACULTURE IN QUEENSLAND. PROCEEDINGS OF THE SEMINAR HELD AT THE
PROFESSIONAL DEVELOPMENT CENTRE, BRISBANE, 24-25 MARCH 1983. 1984, pp. 71-86.

Languages: English

Document Type: Conference; Book

ASFA Number: 115-18135

Abstract:

Three major types of aquaculture systems exist today: intensive, extensive and seed spreading. Present industries concerned with aquaculture include the bait and aquarium industries, the fishing and food industries, the tourist and manufacturing industries, the private small business and government sector, and all the associated marketing industries. Area utilization covers land-based pond culture, enclosure of waterways, netting and fencing off of bays and seashores, underwater cage culture, sea bottom culture and the seeding of seabeds. A brief world history of aquaculture will be presented along with brief outlines of present day culture methods of such diverse groups as algae, cels and marine worms. Four major questions of concern to Queenslanders will be dealt with in depth. Crayfish culture: is it feasible? The scallop industry: can seeding help? Diseases: are they promoted by aquaculture? Lastly but most importantly, what are some of the business problems of aquaculture in Queensland?

Descriptors: aquaculture techniques; aquaculture development

Geographic Descriptors: Australia, Queensland

Environment: Marine; Brackish; Fresh

20

The potential for aquaculture of Cherax destructor (the yabbie).

Carroll, P. N. [ed.]

(Hawkesbury Agricultural Coll., Animal Production Cent., Richmond, N.S.W. 2753, Australia)

Source: A YABBIE POT POURRI. A COLLECTION OF NOTES ON AUSTRALIAN CRAYFISH AND NATIVE FISH (HAWKESBURY AGRICULTURAL COLLEGE, RICHMOND (AUSTRALIA)).

(1981), 20 pp.

Languages: English

Document Type: Conference; Book

ASFA Number: 113-19502

Abstract:

The genus *Cherax* is discussed in terms of its taxonomy and geographic distribution. The marketability of *C. destructor* is considered and compared with that of marine crustaceans. The yield of edible meat and crustacean flavour were found to be less than that in prawns. *C. destructor* is relatively free of disease and is adapted to a wide range of habitats, although does not tolerate many types of pollutants. The ease of breeding and rearing of the larvae were considered, and experiments indicate the importance of water temperatures above 20 degrees C for controlled breeding. Recommendations were made for lighting, temperature, bottom substrate, filtration system, shelters, water quality, stocking density, mating ratio, selection methods, nutrition and predation control. It is concluded that there are a number of problems which need to be resolved before the farming potential of *C. destructor* can be fully realized.

Descriptors: taxonomy; freshwater aquaculture; crayfish culture

Geographic Descriptors: geographical distribution; Australia, Inland Waters

Taxonomic Descriptors: *Cherax destructor*

Environment: Fresh

21

Potential of silver carp in New Zealand aquaculture.

Carruthers, A.D.

(Fish. Res. Div., Minist. of Agr. and Fish., Napier, N.Z.)

Dinamani, P.; Hickman, R.W. [comps.]

Source: Aquaculture Conference, Wellington (New Zealand), September 1979. OCCAS. PUBL. FISH. RES. DIV. MINIST. AGRIC. (N.Z.), no. 27. PROCEEDINGS OF THE AQUACULTURE CONFERENCE. 1980, pp. 73-74.

Languages: English

Document Type: Conference; Book

ASFA Number: 113-14914

Abstract:

The possible use of silver carp (*Hypophthalmichthys molitrix*) in aquaculture in New Zealand is discussed. Indications are that silver carp do not mature sexually in New Zealand until they are 4 years old, when spawning can be induced by a series of hormone injections. As silver carp is a phytoplankton feeder, it can play an important part in the economy of certain types of fish ponds. A possible aquacultural application in New Zealand would be as a supplement to eel and koura farming, where carp could be used to crop the algal blooms in ponds. Another possible use could be to crop the algal blooms in tertiary treatment sewage ponds. There is considerable potential for aquaculture as a means of gaining a return from present day wastes produced from industry, agriculture and domestic sources.

Descriptors: fish culture; aquaculture development
Geographic Descriptors: New Zealand
Taxonomic Descriptors: *Hypophthalmichthys molitrix*
Environment: Fresh

22

Resource potential and policy in marine fisheries and aquaculture in Singapore.

Chan, F.K.; Say Pui Yen, A.

(Dep. Econ. & Stat., Univ. Singapore, Singapore)

Librero, A.R.; Collier, W.L. [eds.]

Source: 2. Bienn. Meet. of the Agricultural Economics Society of Southeast Asia, Tigbauan (Philippines), 3-6 November 1977. ECONOMICS OF AQUACULTURE, SEA-FISHING AND COASTAL RESOURCE USE IN ASIA. PROC. 2 BIENNIAL MEETING OF THE AGRICULTURAL ECONOMICS SOC. OF SOUTHEAST ASIA, NOVEMBER 3-6, 1977, TIGBAUAN, ILOILO, PHILIPPINES. 1979, pp. 237-246.

Languages: English

Document Type: Conference; Book

ASFA Number: 113-14757

Abstract:

The historical development of the fishing industry policy objectives and an evaluation of government - initiated measures are also presented. Data indicate that the fishing industry has been and will continue to play a very small role in the total Singapore economy.

Descriptors: fishery development; aquaculture development; fishery economics; marine fisheries; government policy

Geographic Descriptors: ISEW, Singapore

Environment: Marine

23

Etude de la biologie des especes de poissons du fleuve San Pedro Tabasco (Mexico) en vue de determiner leur potentialite pour la pisciculture.

(Biological study of the fish species of the San Pedro River, Tabasco (Mexico) in order to determine their potential for fish culture.)

Chavez Lomeli, M.O.; Mattheuws, A.E.; Perex Vega, M.H.

(Address not stated)

Source: INST. NAC. INVESTIGACIONES SOBRE RECURSOS BIOTICOS (INIREB), VERACRUZ (MEXICO), (no date), 260 pp.

Languages: French

Document Type: Book

ASFA Number: 114-02125

Abstract:

A biologic study of the fish species of the San Pedro River, Tabasco (Mexico), was made to determine their pisciculture potential. The temperature, water conductivity and calcium carbonate contents of this tropical river were measured. 39 taxa of fish were identified and belong to nine orders: 1) Perciformes, 2) Siluriformes, 3) Atheriniformes, 4) Semiotiformes, 5) Clupeiformes, 6) Elopiformes, 7) Batrachoidiformes, 8) Cypriniformes, and 9) Synbranchiformes. The fish are grouped into four different feeding habits: 1) carnivorous, 2) omnivorous, 3) macrophytophagous, and 4) microphytophagous-detritivorous. According to the period of reproduction three groups exist: 1) from

Abstract (cont.):

February to June or September, 2) all theyear, and 3) September to January. The fish species that can be used in pisciculture are: *Cichlasoma fenestratum*, *C. rectangulare*, *C. pearsei*, *C. urophthalmus*, *C. salvini* and *Brycon guatemalensis*.

Descriptors: freshwater fish; fish culture; biological data; check lists; potential resources

Geographic Descriptors: Mexico, Tabasco, San Pedro R.

Taxonomic Descriptors: *Cichlasoma*; *Brycon guatemalensis*

Environment: Fresh

24

Site selection, structural design, construction, management and production of floating cage culture system in Malaysia.

Chua, T.E.

(Int. Sch. Biol. Sci., Univ. Sains Malaysia, Malaysia)

Source: Workshop on Pen and Cage Culture of Fish, Tigbauan (Philippines), 11 February 1979.

INTERNATIONAL WORKSHOP ON PEN AND CAGE CULTURE OF FISH, 11-22 FEBRUARY, TIGBAUAN, ILOILO, PHILIPPINES. (no date), pp. 65-80.

Languages: English

Document Type: Conference; Book

ASFA Number: 112-13317

Abstract:

The success of cage culture system is largely determined by correct selection of favorable sites, suitable cage size and facilities and management of the system. These three elements are considered in this paper in relation to culture systems in Malaysia.

Descriptors: cage culture; fish culture; aquaculture techniques; site selection

Geographic Descriptors: Malaysia

Environment: Fresh

25

Aquaculture and marine resources potential and policy in Thailand.

Chutiyaputta, K.

(Minist. Agric. and Coop., Bangkok, Thailand)

Librero, A.R.; Collier, W.L. [eds.]

Source: 2. Bienn. Meet. of the Agricultural Economics Society of Southeast Asia, Tigbauan (Philippines), 3-6 November 1977. ECONOMICS OF AQUACULTURE, SEA-FISHING AND COASTAL RESOURCE USE IN ASIA. PROCEEDINGS OF THE SECOND BIENNIAL MEETING OF THE AGRICULTURAL ECONOMICS SOCIETY OF SOUTHEAST ASIA, NOVEMBER 3-6, 1977, TIGBAUAN, ILOILO, PHILIPPINES. 1979, pp. 247-251.

Languages: English

Document Type: Conference; Book

ASFA Number: 113-19175

Abstract:

The characteristics of the coastal areas of Thailand and their resources and uses are described. The fishery resources may be divided into two categories: marine and brackish. The most important fish in the marine catch is *Rastrelliger* sp. Many brackishwater species are cultivated in aquaculture farms (shrimps and mollusks are the most extensive). Offshore mineral exploration and exploitation are considered briefly. The institutional and regulatory framework for coastal area development is described.

Descriptors: marine fisheries; fishery resources; brackish water aquaculture; government policy

Geographic Descriptors: ISEW, Thailand

Environment: Marine; Brackish

26

Aquaculture development.

Source: COFI: Committee on Fisheries, Seventeenth Session, Rome, May 18-22, 1987, 10 pp.

Languages: English

Document Type: Provisional Agenda Text

Report No.: (COFI/87/Inf. 6)

27

Initial feasibility of integrated aquaculture on lava soils in Hawaii.

Costa-Pierce, B.A.

(Aquacult. Program, Int. Cent. Living Aquat. Resour. Manage. (ICLARM), MC P.O. Box 1501, Makati, Metro Manila, Philippines)

Source: AQUACULT. ENG., (1987), vol. 6 (3), pp. 171-182.

Languages: English

Document Type: Journal Article

ASFA Number: 118-05727

Abstract:

The wastewater from a 0x10 ha pond (2x2 m deep) containing a polyculture of Malaysian prawns (*Macrobrachium rosenbergii*), silver carp (*Hypophthalmichthys molitrix*), common carp (*Cyprinus carpio*), and grey mullet (*Mugil cephalus*) was used to irrigate a 0x79 ha mixed tree crop orchard of Solo papayas (*Carica papaya*), hybrid Williams bananas (*Musa* sp.), and Yamigata avocados (*Persea americana*). The integrated system was developed on "waste" lava land (a'a lava) in Hawaii. Productivity after second year is described. Using fishpond wastewaters for irrigating mixed tree crop orchards can improve numerous biological and economic problems of small farmers worldwide where waste agricultural soils exist, as well as providing a secure water source for conventional tree crop agriculture in regions of seasonal rainfall or frequent drought.

Descriptors: agropisciculture; feasibility studies; aquaculture systems; polyculture

Geographic Descriptors: Hawaii

Taxonomic Descriptors: *Macrobrachium rosenbergii*; *Hypophthalmichthys molitrix*; *Cyprinus carpio*; *Mugil cephalus*; Malacostraca Decapoda; Pisces; Cyprinidae; Mugilidae

Environment: Fresh

28

Inventaire des sites potentiels pour l'aquaculture sur le littoral des Cotes du Nord. Fasc. 1: Aquaculture nouvelle.
(Survey of the potential sites for aquaculture on the Cotes du Nord littoral. Part 1: New aquaculture.)

Couteaux, B.; Jegou, A.M.; Merceron, M.; Piriou, J.Y.

(Cent. Oceanol. Bretagne, B.P. 337, 29273 Brest Cedex, France)

Source: Centre National pour l'Exploitation des Oceans, Paris (France), January 1979, 138 pp.

Languages: French

Document Type: Report

ASFA Number: 110-16826

Abstract:

This first inventory of sites favorable for the development of aquaculture on the north coast provides a survey of the natural and human resources of the region. After a description of the littoral -- geomorphology, hydrology and bathymetry, the current state of one new aquaculture and a list of preselected sites with corresponding cartography are presented. Each environmental parameter is assessed from the point of view of its relevance to aquaculture. Certain conservation programs need to be implemented to protect the region against agricultural, domestic and industrial pollution.

Descriptors: aquaculture development; littoral zone

Geographic Descriptors: France, Brittany

Environment: Marine

Identifiers: environment surveys; resource management; sociological aspects; stocking (organisms)

29

Water resource development in central coastal Queensland.

Credlin, B.L.

(Queensland Water Resour. Comm., Qld., Australia)

Pollock, B.R.; Quinn, R.H. [eds.]

Source: Seminar on the Potential of Aquaculture in Queensland, Brisbane (Australia), 24-25 March 1983.

CONF. WORKSHOP SER. DEP. PRIMARY IND. (QUEENSL.), no. QC83012. THE POTENTIAL OF AQUACULTURE IN QUEENSLAND. PROCEEDINGS OF THE SEMINAR HELD AT THE PROFESSIONAL DEVELOPMENT CENTRE, BRISBANE, 24-25 MARCH 1983. 1984, pp. 126-138.

Languages: English

Document Type: Conference; Numerical Data; Book

ASFA Number: 115-18064; 215-07110

Abstract:

The right to use water from watercourses, springs and wells is vested in the Crown by the Water Act through the Commissioner of Water Resources who may authorize its use for various purposes. He is empowered to take measures to conserve such water, to provide for its equitable and beneficial use, and to control works that affect the bed and banks of watercourses. Under the Water Resources Administration Act, the Commissioner is charged, amongst other duties, with collecting and recording information on the surface and underground water resources of the State. The information thus gained is available to persons and bodies contemplating projects involving the use of water, e.g., aquaculture. The area of interest for this paper is from Gladstone to Townsville. The discharge and depth of flow from nine major catchments extending from the Boyne River in the south to the Ross River in the north and numerous smaller streams are measured regularly.

Descriptors: water resources; resource management; resource development; aquaculture development

Geographic Descriptors: Australia, Queensland

Environment: Fresh

30

Feasibility study for establishing a small aquaculture laboratory in United Arab Emirates.

Cuzon, G.

(FAO/UNDP Regional Fisheries Survey and Development Project, Rome (Italy).)

Source: FAO, Rome (Italy), 1980, 26 pp.

Languages: English

Document Type: Book

ASFA Number: 110-18550

Abstract:

The purpose of this book is to evaluate the feasibility of establishing a small aquaculture laboratory in the United Arab Emirates. A preselection of sites was made and many specifications were considered, such as food, tidal range, source of clay, adras in the vicinity, lack of pollution now or in the foreseeable future, good availability of shoreline or adjacent land, the possibility of digging a well for sea water, piped freshwater supply and access by road. It is recommended to try to work on a regional cooperation basis and to maintain contact with the Bahrain laboratory, Fisheries Resource Bureau, and the Kuwait Institute for Scientific Research with regard to technical problems and supply of live food. For the training of people working in the project, it would seem useful to spend a couple of months at the Centre Oceanologique du Pacifique in Tahiti, French Polynesia, where they could become acquainted with intensive methods of rearing shrimps (larvae and juveniles). They could also learn more about pond and tank construction.

Descriptors: aquaculture development; feasibility

Geographic Descriptors: United Arab Emirates

Identifiers: research institutions; Umm al Qaiwan

31

Aquaculture: Situation and outlook report.

Dicks, M.; Harvey, D.

(Econ. Res. Serv., USDA, 1301 New York Ave, NW, Washington, DC 20025)

Source: U.S. Department of Agriculture, Economic Research Service, March 1989, 39 pp.

Languages: English

Document Type: Report

Report No.: AQUA-2

Descriptors: aquaculture production; sales; aquaculture; economics

32

*Aquaculture development in Zambia. Report of a mission to study the feasibility of commercial fish-farming
24 June-20 July 1978.*

FAO/UNDP Aquaculture Devel. Coord. Prog., Rome, (Italy)

Source: FAO, ROME (ITALY), 1980, 68 pp.

Languages: English

Document Type: Report

ASFA Number: 111-00841

Abstract:

The existing gap between supply and demand for fish in Zambia is a result of reduced imports from neighboring countries and unsatisfactory marketing and distribution of the domestic production of fish. Fish production through aquaculture has been identified by the Zambian Government, as well as by different international agencies, as a promising and viable means of overcoming this problem at least partially. Fish-farming on a large scale, as proposed in this report, or by small-scale rural aquaculture would make use of the potential which exists in the country. Fish-farming, especially if combined with animal husbandry, would diversify production, improve the nutritional standard of the rural population, and provide low-cost animal protein to the urban markets. Additional employment and income would be created, and the general impact on the standard of living of the people involved in aquaculture production would be considerable.

Descriptors: fish culture; aquaculture development

Geographic Descriptors: Zambia

Environment: Fresh

Identifiers: freshwater aquaculture; polyculture; marketing; trade; aquaculture facilities; development projects

33

Etude du potentiel aquacole et propositions pour une politique de developpement de l'aquaculture en Tunisie.

Rapport d'une mission multidisciplinaire TCP.ADCP en Tunisie mars-juin 1982.

(Study on aquaculture potential and proposals for an aquaculture development policy in Tunisia. Report of a TCP/ADCP multidisciplinary mission in Tunisia, March-June 1982).

FAO/UNDP Aquaculture Devel. Coord. Prog., Rome (Italy)

Source: FAO, ROME (ITALY), 1983, 244 pp.

Languages: French

Document Type: Book

Report No.: FAO ADCP/MR/83/21

ASFA Number: 114-19091

Abstract:

The study evaluated the situation of aquaculture in Tunisia for marine, brackish water and freshwater culture. Conditions determining the future of aquaculture activities in Tunisia were studied, those concerning site suitability, feeding, personnel and market characteristics. A proposal was made for the development of aquaculture, being divided into two aspects: 1) a series of rearing systems and 2) propositions of an institutional nature. Detailed information is included in annexes, abstracts of which are cited individually in ASFA.

Descriptors: aquaculture development

Geographic Descriptors: report literature; Tunisia

Environment: Marine; Brackish; Fresh

34

Selection of site for fishpen farming (SCS/PCC/WP-1).

Felix, S.S.

(Bur. Fisheries and Aquatic Resour., Manila, Philippines)

Guerrero, R.D. III; Soesanto, V. [eds.]

Source: Training Course on Small-Scale Pen and Cage Culture for Finfishes, Los Banos (Philippines). Aberdeen (Hong Kong), 26 October 1981. REPORT OF THE TRAINING COURSE ON SMALL-SCALE PEN AND CAGE CULTURE FOR FINFISH, LOS BANOS, LAGUNA, PHILIPPINES, 26-31 OCTOBER 1981, AND ABERDEEN, HONG KONG, 1-13 NOVEMBER 1981. 1982, pp. 7-15.

Languages: English

Document Type: Conference; Book

ASFA Number: 113-19449

Abstract:

Some of the factors thought to be of importance in the selection of fishpen sites are: 1) area sheltered from high wind or typhoon, 2) depth of water, 3) prevailing wind direction and fish food distribution, 4) lake water circulation, 5) availability of fish fingerlings at reasonable price, 6) accessibility to land and water transportation and to market, 7) water condition, 8) lake bottom soil, 9) peace and order condition and 10) labor.

Descriptors: fish culture; cage culture; site selection

Geographic Descriptors: Philippines

Environment: Marine; Brackish; Fresh

35

Training on assessment of coastal aquaculture potential, Malaysia.

Gedney, R.H.; Kapetsky, J.M.; Kuhnhold, W.W.

(FAO/UNDP South China Sea Fisheries Development and Coordination Program, Manila, Philippines)

Source: FAO/UNDP, MANILA (PHILIPPINES), 1982, 83 pp.

Languages: English

Document Type: Book

Report No.: SCS/GEN/82/35

ASFA Number: 112-15717

Abstract:

The training mission was planned to both assist the government in developing procedures for assessing coastal aquaculture potential with respect to primarily fishpond culture and also to aid in evaluating the Balik Pulan site in Pinang. The report is presented under the following main headings: 1) Developmental considerations, 2) Construction costs for the Malaysian model, 3) Analysis of economic data, 4) First-stage screening - site selection at the national level, 5) Second-stage screening - site selection at the field level, 6) Rating of the proposed site at Kampung Sungei Pinang, Balik Pulau District and 7) Summary conclusions and recommendations.

Descriptors: aquaculture development; training; site selection; pond culture

Geographic Descriptors: Malaysia

Environment: Marine; Brackish

36

Environmental management of aquaculture projects in Queensland.

Gilmour, J.J.; Moore, S.R.

(Queensland Premier's Dep., Qld., Australia)

Pollock, B.R.; Quinn, R.H. [eds.]

Source: Seminar on the Potential of Aquaculture in Queensland, Brisbane (Australia), 24-25 March 1983.
CONF. WORKSHOP SER. DEP. PRIMARY IND. (QUEENSL.), no. QC83012. THE POTENTIAL OF
AQUACULTURE IN QUEENSLAND. PROCEEDINGS OF THE SEMINAR HELD AT THE
PROFESSIONAL DEVELOPMENT CENTRE, BRISBANE, 24-25 MARCH 1983. 1984, pp. 139-151.

Languages: English

Document Type: Conference; Book

ASFA Number: 115-18065

Abstract:

Environmental management in Queensland has been developed as a system which is based on specific "issue orientated" statutory controls, and an overall assessment of the effects of new developments prior to their approval. The current process of environmental management in Queensland and the legislation embodying specific environmental controls are discussed, in relation to the possible procedures required for the establishment of aquaculture projects in this State. The responsibilities of government bodies in administering the relevant statutory controls, along with the required policies of environmental impact assessment procedures, are reviewed. Considerations to be taken into account by developers when supplying information on proposed aquaculture projects are outlined, and a possible draft format for an Environmental Impact Assessment Study Report is provided.

Descriptors: aquaculture regulations; environment management

Geographic Descriptors: Australia, Queensland

37

American seafood consumption up.

Green, D.

(UNC Sea Grant, Box 8605, NC St. Univ., Raleigh, NC 27695, USA)

Source: Seafood Current, Summer 1988, vol. 2 (3), pp. 1-3.

Languages: English

Document Type: Journal Article

Descriptors: seafood consumption; trend; export; import

Geographic Descriptors: United States

38

Potential of algal production.

Grobbelaar, J.U.

(Inst. Environ. Sci., Univ. O.F.S., P.O. Box 339, Bloemfontein 9300, South Africa)

Source: Symp. Aquaculture in Wastewater, 24-26 November 1980, CSIR Conf. Cent., Pretoria, South Africa.

WATER S.A., (1982), vol. 8 (2), pp. 79-85.

Languages: English

Document Type: Journal Article

ASFA Number: 112-12878

Abstract:

Algae, as all green plants, photosynthesize, take up nutrients, utilize light energy and produce new biomass. Production rates of 54 g m^{super(-2)} d^{super(-1)} representing a light utilization efficiency of almost 4% in terms of total radiation, have been measured in open semi-defined systems. More than 50% of the produced biomass is protein. The minimal nutrient removal can be 2 g N m^{super(-2)} d^{super(-1)}, 0.09 g P m^{super(-2)} d^{super(-1)}, and 24 g C m^{super(-2)} d^{super(-1)}. These characteristics

Abstract (cont.):

make algae particularly attractive for food production (especially protein-rich foods), waste treatment, and bioenergy conversion. Dense open outdoor cultures of algae are subject to infections and parasitism, especially by protozoa and rotifers. This affects the quality of the biomass as well as yields. A mathematical model has been developed, calibrated and verified in a study to optimize production rates. The model can be used to predict optimal biomass concentrations for use in outdoor algal ponds.

Descriptors: production (biological); biomass; proteins; mathematical models

Taxonomic Descriptors: algae

39

Present status of mariculture study in Japan for tuna species.

Harada, T.

(Shirahama Fish Lab, Kinki Univ, Nishi-Mure, Wakayama 648-22, Japan)

Source: Presented at: Working Group on Biology, Fisheries, and Potential Aquaculture of Mediterranean Tunas, Sete (France), 9 May 1979. LE THON ROUGE EN MEDITERRANEE. BIOLOGIE PECHE ET AQUACULTURE, CNEXO PARIS (FRANCE), 1979, pp. 163-167.

Languages: English

Summary Languages: English; French

Document Type: Conference; Book

ASFA Number: 110-05143

Abstract:

The study of mariculture of tuna species started in 1969 in Japan. There have been two types of trial employed: (1) after stripping the eggs from naturally mature adults and artificial fertilization, the newly hatched larvae were reared in indoor tanks, (2) on-growing of juveniles in net cages after collecting them from the open sea. In the initial stage of research neither of the two types of trial was very successful, but year by year the technology has improved and at this time success has been achieved with several species. In this paper recent research results are reported in detail for four species- yellowfin tuna *Thunnus albacares*, bonito *Sarda orientalis*, frigate mackerel *Auxis tapeinosoma* and *A. thazard*. Bluefin tuna *Thunnus thynnus* cannot be successful owing to not getting mature eggs.

Geographic Descriptors: Japan

Taxonomic Descriptors: *Thunnus albacares*; *Auxis tapeinosoma*; *Auxis thazard*; *Thunnus thynnus*; Thunnidae

Environment: Marine

40

Potential for penaeid shrimp culture in the Bahamas.

Haxby, R.E.

(Morton Salt Co., Matthew Town, Inagua, Bahamas)

Higman, J.B. [cd.]

Source: Presented at: 35. Annual Gulf and Caribbean Fisheries Institute, Nassau (Bahamas), November 1982. PROC. GULF AND CARIBBEAN FISHERIES INST., no. 35., PROC. THIRTY-FIFTH ANNUAL CONFERENCE, NASSAU, BAHAMAS, NOVEMBER 1982. 1983, pp. 19-26.

Languages: English

Document Type: Conference; Book

ASFA Number: 114-14725

Abstract:

This paper outlines the recent developments in penaeid shrimp culture and discusses the environmental requirements for commercialization. With its clean, unpolluted water and tropical climate, the Bahama Islands offer suitable sites for commercial ventures in shrimp mariculture. A stable, democratic government which encourages foreign investment makes The Bahamas even more attractive. By enumerating each of these issues and developing them as they relate to The Bahamas, the author shall illustrate the potential for penaeid shrimp culture in The Bahamas.

Descriptors: shellfish culture; aquaculture techniques

Geographic Descriptors: Bahama I.

Taxonomic Descriptors: Penacidae

Environment: Marine

41

Fisheries legislation relating to aquaculture.

Haysom, N.M.

(Div. Dairying and Fish., Dep. Primary Ind., Brisbane, Qld., Australia)

Pollock, B.R.; Quinn, R.H. [eds.]

Source: Seminar on the Potential of Aquaculture in Queensland, Brisbane (Australia), 24-25 March 1983.

CONF. WORKSHOP SER. DEP. PRIMARY IND. (QUEENSL.), no. QC83012. THE POTENTIAL OF AQUACULTURE IN QUEENSLAND. PROCEEDINGS OF THE SEMINAR HELD AT THE PROFESSIONAL DEVELOPMENT CENTRE, BRISBANE, 24-25 MARCH 1983. 1984, pp. 181-185.

Languages: English

Document Type: Conference; Book

ASFA Number: 115-18069

Abstract:

Various types of aquaculture are controlled under different sections of the fisheries legislation in Queensland. In general, some forms are actively encouraged while others are discouraged or constrained in favor of alternative uses of our aquatic resources and environment. An outline is given of current Government policy in relation to these conflicting uses, and of the various sections of the fisheries legislation governing aquaculture practice in this State. An indication is given of the information which needs to be provided by would-be aquaculturists in applying for a license or permit, and an explanation is given of the need for such information to be supplied.

Descriptors: aquaculture regulations; legislation

Geographic Descriptors: Australia, Queensland

42

Marine prawn farming in Australia: Lessons from the past and prospects for the future.

Heasman, M.P.

(Fish. Res. Branch, Dep. Primary Ind., Brisbane, Qld., Australia)

Pollock, B.R.; Quinn, R.N. [eds.]

Source: Seminar on the Potential of Aquaculture in Queensland, Brisbane (Australia), 24-25 March 1983.

CONF. WORKSHOP SER. DEP. PRIMARY IND. (QUEENSL.), no. QC83012 THE POTENTIAL OF AQUACULTURE IN QUEENSLAND. PROCEEDINGS OF THE SEMINAR HELD AT THE PROFESSIONAL DEVELOPMENT CENTRE, BRISBANE, 24-25 MARCH 1983. 1984, pp. 1-14.

Languages: English
Document Type: Conference; Numerical Data; Book
ASFA Number: 115-18280
Abstract:

In spite of the overt failure of marine (penaeid) prawn farming in the United States during the 1960's, a similar history was repeated in Australia during the 1970's. This history is briefly reviewed. Great advances, particularly in the area of semi-intensive pond rearing techniques, have nevertheless been made over the past decade. With the development and use of cheap supplementary feeds, annual production rates have been raised from several hundred to several thousand kilograms per hectare whilst food conversion quotients have been lowered from 6-10:1 to 2-3:1. An investment analysis for a hypothetical marine prawn farm in northern Australia is developed using these improved food-cost and production figures. Whilst results are encouraging, it is strongly cautioned that many assumptions made need to be tested locally in pilot scale research and development programs. It is suggested that responsibility for financing of such programs should lie at least in part with government.

Descriptors: shrimp culture; aquaculture development
Geographic Descriptors: Australia
Taxonomic Descriptors: Penaeidae
Environment: Marine

43

Report of assistance on selection of site, design, construction and management of the Ban Merbok, Kedah, Malaysia Brackish water Aquaculture Demonstration Project.

Hechanova, R.G.; Tiensoongrumsree, B.

(FAO/UNDP South China Fisheries Development and Coordinating Programme, Manila (Philippines))

Source: SCS Manila (Philippines), April 1980, 153 pp.

Languages: English

Document Type: Book

ASFA Number: 111-00830

Abstract:

The work consisted in selecting site, preparing the design and construction procedure, and setting guidelines for the future operation of the project. There was a question whether to establish the pilot family-size small-holder pond demonstration inside or outside a manmade bund in the area. The technical and socioeconomic considerations were appraised in each case, and it was determined that demonstration outside the bund was more advantageous. To ensure the continuing supply of stocking material for penaeid shrimp and finfish, a complementary project consisting of the establishment of a hatchery was also looked into. Prospective sites were surveyed and preliminary selection of the most suitable area was determined. Preliminary guidelines for the construction and operation of the hatchery were also laid down.

Descriptors: brackish water aquaculture; aquaculture development
Geographic Descriptors: Malaysia, Ban Merbok
Environment: Brackish
Identifiers: pond culture; fish culture; crustacean culture; hatcheries

44

Salmon farming in Washington: The issues and the potential.

Heggelund, Per O.

Source: PACIFIC NORTHWEST EXECUTIVE, January 1989, pp. 2-6.

Languages: English

Document Type: Journal Article

45

Production potential of catfish grow-out ponds supplementally stocked with silver and bighead carp.

Henderson, S.

(Arkansas Game and Fish Comm., 2 Natural Resources Drive, Little Rock, AK 72205, USA)

Source: Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies. Presented at: 33. Annual Conference Southeastern Association of Fish and Wildlife Agencies Hot Springs, AR (USA), 21 October 1979. (1979), pp. 33, 584-590.

Languages: English

Document Type: Conference; Journal Article

ASFA Number: 111-16856

Abstract:

Three experimental ponds were stocked with a polyculture of channel catfish (*Ictalurus punctatus*), silver carp (*Hypophthalmichthys molitrix*), and bighead carp (*Aristichthys nobilis*). Three control ponds were stocked with catfish alone. In two of the three sets of ponds, there was little difference in catfish production (less than 1 and 10% by weight) while total production in the polyculture ponds far exceeded the controls with catfish alone. In the remaining set, catfish production was less in the polyculture pond but total production remained higher as a result of the additional growth of the silver and bighead carp. Lesser objectives were to refine artificial spawning methods and describe the difference in water quality resulting from the presence of the filter-feeding Chinese carps. Successful hormone-induced spawning techniques were developed and an improvement in pond water quality was noted.

Taxonomic Descriptors: *Ictalurus punctatus*; Cyprinidae

Environment: Fresh

Identifiers: *Hypophthalmichthys molitrix*; *Aristichthys nobilis*; Ictaluridae; Pisces

46

Genetic potential for fresh- and seawater growth of net-pen cultured coho salmon.

Hershberger, W.K.; Iwamoto, R.N.; Saxton, A.M.; Melteff, B.R.

(Washington Univ., Coll. Fish., Seattle, WA 98105, USA)

Neve, R.A. [ed.]

Source: North Pacific Aquaculture Symposium, Anchorage, AK (USA). Newport, OR (USA) 18 August 1980. 25 August 1980. ALASKA SEA GRANT REP. ALASKA SEA GRANT PROGRAM ALASKA UNIV. PROCEEDINGS OF THE NORTH PACIFIC AQUACULTURE SYMPOSIUM. (also as Washington University, College of Fisheries, Contribution No. 550). 1982, pp. 185-192.

Languages: English

Document Type: Conference; Report

ASFA Number: 113-17099

Report No.: ASG-82-2

Abstract:

DomSea Farms, Inc., a commercial net-pen operation in Puget Sound, Washington with University of Washington personnel has collaborated in developing a program of systematic breeding and selection as well as determining the requirements of captive coho salmon brood stock. Some of the genetic results from the initial 3 years of the program are summarized. These include genetic and phenotypic variances and correlations, and heritabilities of smoltification and freshwater and seawater growth, determined from analysis of the progeny of 2 brood years. The genetic basis for freshwater and seawater growth of 2 brood years of accelerated, pen-reared coho salmon have been established.

Descriptors: genetics; growth; cage culture; selective breeding; brood stocks

Geographic Descriptors: USA, Washington

Taxonomic Descriptors: *Oncorhynchus kisutch*

Environment: Marine; Brackish

47

Aquaculture of the mud crab (Scylla serrata).

Hill, B.J.

(CSIRO Div. Fish. Res., Australia)

Pollock, B.R.; Quinn, R.H. [eds.]

Source: Seminar on the Potential of Aquaculture in Queensland, Brisbane (Australia), 24-25 March 1983.

CONF. WORKSHOP SER. DEP. PRIMARY IND. (QUEENSL.), no. QC83012. THE POTENTIAL OF AQUACULTURE IN QUEENSLAND. PROCEEDINGS OF THE SEMINAR HELD AT THE PROFESSIONAL DEVELOPMENT CENTRE, BRISBANE, 24-25 MARCH 1983. 1984, pp. 29-44.

Languages: English

Document Type: Conference; Book

ASFA Number: 115-18284

Abstract:

The culture of the mud crab *S. serrata* is reviewed against a knowledge of its biology and suitability for rearing. The life cycle involves a larval phase spent at sea and a crab phase found in inshore sheltered areas such as estuaries and rivers. These two phases require distinctly different culture conditions. Data on natural diet, population density, growth, diseases and parasites are discussed with a view to determining requirements and identifying problems which may arise in culturing of this species. In Queensland, legislation aimed at protecting females and setting size limits could conflict with optimal aquaculture production of mud crabs. It is concluded that because of the many unknown factors at present and the absence of a hatchery to provide postlarval crabs, rearing of mud crabs should not be attempted by the small investor.

Descriptors: crab culture

Geographic Descriptors: aquaculture development; Australia, Queensland

Taxonomic Descriptors: *Scylla serrata*

Environment: Marine; Brackish

Economic problems of marine fish culture with special reference to bluefin tuna.

Hirasawa, Y.

(Lab. Management Science, Tokyo Univ. Fish., Tokyo, Japan)

Source: Presented at: Working Group on Biology, Fisheries, and Potential Aquaculture of Mediterranean Tunas, Sete (France), 9 May 1979. LE THON ROUGE EN MEDITERRANEE. BIOLOGIE PECHE ET AQUACULTURE, CNEXO PARIS (FRANCE), 1979, pp. 169-184.

Languages: English

Summary Languages: English; French

Document Type: Conference; Book

ASFA Number: 110-05147

Abstract:

The culture of bluefin tuna has not yet reached a practical business stage in Japan and it is still only in the experimental stage. There is, however, a long history of yellow-tail *Seriola* and kuruma shrimp *Penaeus* culture. This paper examines the most important factors affecting the economics of mariculture with special reference to bluefin tuna using the following formula: $A/B > a/b$ where A is the selling price per kg of marketable fish, B is the buying price per kg of feed, a is the conversion ratio from feed to fish and b is the weight of feed in total cost.

Geographic Descriptors: Japan

Taxonomic Descriptors: *Thunnus thynnus*

Environment: Marine

Identifiers: feasibility; cost analysis

Contribution a l'etude d'especes utilisables en aquaculture en eau chaude. Premieres donnees sur la croissance du poisson Bagridae Chrysichthys walkeri Gunther 1899.

(Contribution to the study of potential species for aquaculture in warm waters. First data on growth of *Chrysichthys walkeri* Gunther 1899 (Bagridae).)

Hirigoyen, J.P.; Petel, C.

(Cent. Tech. For. Trop., Div. Rech. Piscic., B.P. 621, Bouake, Cote d'Ivoire)

Source: Notes Doc. Peche Piscic. (Nouv. Ser.), (no. 18), (1978), pp. 1-9.

Languages: French

Document Type: Journal Article

ASFA Number: 110-14786

Abstract:

The reproduction of *C. walkeri* occurs naturally in ponds during the rainy season. The growth curve presented shows: (1) the low growth rate of this fish and (2) the difference in growth between males and females.

Descriptors: growth; freshwater aquaculture

Geographic Descriptors: Ivory Coast

Taxonomic Descriptors: *Chrysichthys walkeri*

Environment: Fresh

Identifiers: reproduction (biology); Bagridae; Pisces; fish culture

50

Leadership in aquaculture development.

Hougart, Bille

(U.S. Department of Agriculture, Cooperative State Research Service, Office of Aquaculture,
Washington, D.C.)

Source: U.S. Department of Agriculture, Cooperative State Research Service, OGPS, February 1987, 7 pp.

Languages: English

Document Type: Pamphlet

51

Freshwater fish farming in Jordan. Final report on Phase AA: Feasibility study.

[Hughes, Kelvin]

(Ministry of Agriculture, Amman (Jordan))

Source: [Kelvin Hughes] Aquacult. Serv., London (UK), November 1978, 365 pp.

Languages: English

Document Type: Book

ASFA Number: 109-16654

Abstract:

The feasibility of freshwater fish farming in Jordan was studied by a field team of four in June-August 1978. The history of fish-farming in Jordan to date and the events which led up to the commissioning of this feasibility study have been reviewed. The current status of fish farming in Jordan is discussed. Species of indigenous fish which are most suitable have been selected. Techniques of various types of freshwater fish-farming are described in an assessment of the resources necessary for their development. The resources available for the development of fish-farming in Jordan have been examined, such as labor and feedstuffs, and of environmental characteristics particular attention was paid to the availability and value of land and water. Over 40 specific sites with possible potential for freshwater fish-farming were visited and assessed during the study. A general view of the likely capital and running costs of fish-farming in Jordan is followed by costing of a number of the specific sites with greatest potential for development. In addition, fingerling farms have been costed to assess the true cost of fingerling production. The existing fish industry in Jordan has been reviewed and the harvesting, distribution and marketing needs of an expanded industry assessed. The potential market for farmed fish is reviewed and projections of market value made.

Descriptors: fish culture; aquaculture development

Geographic Descriptors: Jordan

Environment: Fresh

Identifiers: freshwater aquaculture; feasibility

52

Feasibility study of restocking tuna species using hatchery product seed.

Inoue, M.

Source: Presented at: Working Group on Biology, Fisheries, and Potential Aquaculture of Mediterranean Tunas, Sete (France), 9 May 1979. LE THON ROUGE EN MEDITERRANEE. BIOLOGIE PECHE ET AQUACULTURE, CNEXO PARIS (FRANCE), 1979, pp. 209-213.

Languages: English

Summary Languages: French; English

Document Type: Conference; Book

ASFA Number: 110-05149

Abstract:

The biological and ecological factors enabling the rearing of tuna species with the purpose of restocking oceans are presented. Such effort will require research on the following points to be investigated: (1) controlled reproduction from mature fishes kept in captivity, (2) rearing of larva up to the juvenile stage and mass production of their foods, (3) conditioning juveniles for rearing in natural environment.

Taxonomic Descriptors: Thunnidae

Environment: Marine

Identifiers: stock assessment; hatcheries; juveniles

53

Brief description of fish mariculture facilities in Kochi prefecture, Japan.

Ishida, Y.

(Kochi Prefectural Fish. Res. Stn., Suzaki, Kochi 785-01, Japan)

Source: Presented at: Working Group on Biology, Fisheries, and Potential Aquaculture of Mediterranean Tunas, Sete (France), 9 May 1979. LE THON ROUGE EN MEDITERRANEE. BIOLOGIE PECHE ET AQUACULTURE, CNEXO Paris (France), 1979, pp. 185-193.

Languages: English

Summary Languages: English; French

Document Type: Conference; Book

ASFA Number: 110-05107

Abstract:

The annual mariculture production of Japan was 114,991 tons in 1976. The species raised by mariculture are yellowtail, red sea bream, mackerel, etc. The production of yellowtail accounts for 97% of total. The facilities for fish culture are divided into three types: embayment, outer bay and offshore types depending on geographical and meteorological conditions. In this paper the structure of these facilities and damage caused by typhoon are described in detail. In order to make the layout of a unit resistant to strong waves, some conditions are discussed based on the experiments.

Geographic Descriptors: INW, Japan

Environment: Marine

Identifiers: coastal zone; coastal structures; typhoons

54

Aquaculture projects - how to assess their economic feasibility.

Israel, D.C.

(SEAFDEC Aquaculture Dep., Metro Manila, Philippines)

Source: SEAFDEC NEWSL., (1987), vol. 10, no. 2, pp. 2, 14-15.

Languages: English

Document Type: Journal Article

ASFA Number: 119-01559

Abstract:

A brief review is made of factors to be taken into account in applying economic feasibility analysis of aquaculture products.

Descriptors: aquaculture development; economic analysis; economic feasibility

55

Idaho has geothermal aquaculture potential.

Jewel, K.J.

Source: AQUACULT. MAG., (1984), vol. 10 (6A), pp. 24-25, 28 + .

Languages: English

Document Type: Journal Article

ASFA Number: 115-20104

Abstract:

An account is given of geothermal aquaculture in Idaho and prospects for development, with respect to research undertaken by the Geothermal Aquaculture Research Foundation in Boise, concerning tilapia, freshwater prawn and tropical fish culture.

Descriptors: geothermal springs; thermal aquaculture

Geographic Descriptors: aquaculture development; USA, Idaho

Environment: Fresh

56

Status and potential for development of freshwater fish culture in Malaysia.

Ji, L.S.

(Int. Fish. Ext., Fish. Div., Minist. Agric., Kuala Lumpur, Malaysia)

Source: Presented at: Symposium on the Development and Utilization of Inland Fishery Resources, Colombo (Sri Lanka), 27 October 1976. Indo-Pacific Fisheries Council, Colombo (Sri Lanka). Indo-Pacific Fish. Council. Proc. 17th session, Colombo, Sri Lanka, 27 October-5 November 1976, Section 3. Symposium on the Development and Utilization of Inland Fishery Resources. FAO Regional Office for Asia and the Far East, Bangkok (Thailand). 1977, pp. 96-108.

Document Type: Conference; Book

ASFA Number: 109-01582

Abstract:

Fish culture in ponds and disused mining pools produces an estimated 9,600 tons per year from 5,760 hm...of ponds. Polyculture is the usual system of aquaculture practised. The common species cultured are listed and stocking ratios, spawning and nursery practices described. The commonly occurring diseases of pond fish and methods used for treatment are described. Yields per hectare per year range from 1,200 kg to 2,700 kg depending on stocking density and management. The average yield is around 1,500 kg per hectare. A brief discussion on the economics of fish culture is included. Research includes work on the development of an efficient system of fish/prawn polyculture, simplification of the techniques of prawn and fish seed production and investigation into the potential for culture of local, valuable fish species. Constraints to development include the lack of fishery scientists and technical know-how, inadequate knowledge of the economics of fish culture especially on a largescale, and some lack of acceptance of freshwater fish in the coastal areas. The problem of land-use conflict does not arise to any great extent as most fish ponds are sited in low-lying areas which are unsuitable for agriculture. Fish culture in cages and fish-pens is constrained by the security measures imposed on certain reservoirs. Fish culture is expected to develop through the intensification of culture methods, improvement of seed supply, improvement of feeds and feed supply, introduction of cageculture and pen culture and the culture of local, riverine species.

Geographic Descriptors: Malaysia

Environment: Fresh

Identifiers: pond culture; yield; polyculture; diseases; economics; crustacean culture; cage culture

57

The aquaculture potential of New Zealand freshwater crayfish.

Jones, J.B.

(Fish. Res. Div., Wellington, New Zealand)

Source: N.Z. AGRIC. SCI., (1981), vol. 15 (1), pp. 21-23.

Languages: English

Document Type: Journal Article

ASFA Number: 112-05258

Abstract:

This review of the markets for, and culture potential of, the New Zealand freshwater crayfish (*Paranephrops*) attempts to show that, while high-density aquaculture of crayfish is feasible, it would almost certainly be uneconomic if practised on its own.

Descriptors: crustacean culture; aquaculture development; freshwater aquaculture

Geographic Descriptors: New Zealand

Taxonomic Descriptors: *Paranephrops*

Environment: Fresh

58

Potentsial'nye svoystva gidrobiontov kak rezerv povysheniya ehffektivnosti marikul'tury.

(Potential of aquatic organisms for marine aquaculture.)

Karpevich, A.F.

Sokolov, V.E.; Skarlato, O.A. [eds.]

Source: BIOL. RESURSY GIDROSF. I IKH ISPOL'Z.

BIOLOGICHESKIE OSNOVY AKVAKUL'TURY V MORYAKH EVROPEJSKOJ CHASTI S.S.S.R.
(BIOLOGICAL PRINCIPLES OF AQUACULTURE IN THE USSR EUROPEAN SEAS.)

1985, pp. 17-33.

Languages: Russian

Document Type: Book

ASFA Number: 116-08632

Abstract:

Ecologo-physiological and biotic potential of fishes and invertebrates is considered as dependent on the physiological plasticity of an individual at different stages of development (physiologo-ontogenetic potency), on the position of population in the ecological range of the species (population potency) and on the species origin (phylogenetic potency). The highest and lowest ecologo-physiological potential is observed in boreal and arctic-antarctic species, respectively, with the tropical species occupying intermediate position. It is shown that the ecological optima of populations and species do not coincide. The further the position of the population is from the ecological optimum of the species, the lower is the ecological and the higher is the biotic potency of its individuals. The formation in the nurseries of environmental conditions favorable for the realization of biotic potency (growth, fecundity, etc.) of cultured species is necessitated.

Descriptors: marine aquaculture; aquaculture development; ecophysiology; biotic factors

Environment: Marine

59

Etude de faisabilite de las pisciculture des poissons appats pour la peche bonitiere a la canne dans la zone d'action de la Commission du Pacifique Sud.

(An examination of the feasibility of baitfish culture for skipjack pole-and-line fishing in the South Pacific Commission Area.)

Kearney, R.E.; Rivkin, M.L.

(South Pacific Comm., Noumea (New Caledonia))

Source: RAPP. TECH. PROGRAMME "BONITE" COMM. PAC. SUD., no. 4.

SPC, NOUMEA (NEW CALEDONIA), 1982, 26 pp.

Languages: French

Document Type: Book

ASFA Number: 113-09085

Abstract:

This paper was prepared in response to requests from several South Pacific Commission countries for information on the feasibility of establishing commercial live bait culture programs.

Descriptors: baitfish; bait culture

Geographic Descriptors: feasibility studies; IS, South Pacific

Environment: Marine; Brackish

60

An examination of the feasibility of baitfish culture for skipjack pole-and-line fishing in the South Pacific commission area.

Kearney, R.E.; Rivkin, M.L.

(South Pacific Comm., Noumea (New Caledonia). Skipjack Surv. and Assessment Program)

Source: TECH. REP. SKIPJACK PROGRAMS. PAC. COMM., no. 4.

SPC, NOUMEA (NEW CALEDONIA), 1981, p. 23.

Languages: English

Document Type: Book

ASFA Number: 112-02602

Abstract:

This paper examines the important aspects of live bait culture for which data are available, and considers these in the context of overall fisheries development objectives. Moreover, it gives indications of the strategies countries might adopt in developing cultured baitfish resources. Factors influencing the extent to which live bait culture is possible are discussed and an estimation of the economic feasibility of baitfish culture is presented.

Descriptors: baitfish; fish culture; fishery development; feasibility; pelagic fisheries

Geographic Descriptors: IS, Pacific

Taxonomic Descriptors: *Katsuwonus pelamis*

Environment: Marine

61

Maximizing aquaculture potential in municipal wastewater ponds.

King, D.L.; Spencer, C.N.

(Michigan State Univ., Inst. Water Res., East Lansing, MI USA)

Source: MSU, EAST LANSING, MI (USA), 1983, 44 pp.

Languages: English

NTIS Order No.: PB83-190660 Contract DI-14-31-0001-9077. OWRT-B-052-MICH(1).

Document Type: Report

Report No.: W83-02485, OWRT-B-05

ASFA Number: 113-19477

Abstract:

Factors controlling the composition and growth of aquatic plants were investigated in four wastewater treatment ponds in southern Michigan. These ponds contained various densities of predatory fish (largemouth bass, *Micropterus salmoides*) and planktivorous fish (fathead minnows, *Pimephales promelas* and brook stickleback, *Culaea inconstans*) as well as different nutrient concentrations. Ponds developed either of two dominant plant communities in response to predation and grazing pressures. In ponds with high densities of planktivorous fish, intense fish predation kept cladoceran zooplankton densities low and phytoplankton formed the dominant plant community. Ponds with low planktivorous fish densities maintained much higher cladoceran densities which effectively grazed the phytoplankton. Macrophytes and periphyton dominated these ponds. Growth limitation and seasonal succession within the dominant plant community were largely controlled by a combination of chemical and physical factors including depletion of inorganic nitrogen and carbon dioxide and changes in light availability and temperature.

Descriptors: physicochemical properties; wastewater aquaculture; growth; plankton

Geographic Descriptors: USA, Michigan

Taxonomic Descriptors: *Pimephales promelas*; *Micropterus salmoides*; *Culaea inconstans*

Environment: Fresh

Identifiers: community composition

62

Aquaculture - A critical assessment of its potential and future.

Kinne, O.

(Biol. Anstalt Helgoland, Hamburg, GFR)

Source: INTERDISCIPLINARY SCI. REV., (1980), vol. 5 (1), pp. 24-32.

Languages: English

Document Type: Journal Article

ASFA Number: 110-18554

Abstract:

While important for making additional food available, aquaculture is--in the foreseeable future--unlikely to contribute more than a few percent of additional food to the global protein yield for the growing human population. Some 85% of the world's total annual protein yield is at present produced by agriculture and some 14% by fisheries. Aquaculture must focus more on micro-organisms, plants and herbivorous animals, and long-term research programs should test such feasibilities as utilizing the synthetic mechanisms of low-trophic-level organisms for producing essential portions of the human diet from waste materials and providing tailor-made diets for meeting specific physiological - nutritional needs of man.

Descriptors: aquaculture; human food

63

A history of marine fish culture in Europe and North America.

Kirk, R.

Source: Fishing News Books, Ltd., Farnham, Surrey, England, 1987, 192 pp.

Languages: English

Document Type: Book

64

Assistance available to Queensland manufacturing industry.

Lawrie, S.M.

(Dep. Commercial and Indust. Dev., Qld., Australia)

Pollock, B.R.; Quinn, R.H. [eds.]

Source: Seminar on the Potential of Aquaculture in Queensland, Brisbane (Australia), 24-25 March 1983.

CONF. WORKSHOP SER. DEP. PRIMARY IND. (QUEENSL.), no. QC83012. THE POTENTIAL OF AQUACULTURE IN QUEENSLAND. PROCEEDINGS OF THE SEMINAR HELD AT THE PROFESSIONAL DEVELOPMENT CENTRE, BRISBANE, 24-25 MARCH 1983. 1984, pp. 206-209.

Languages: English

Document Type: Conference; Book

ASFA Number: 115-18070

Abstract:

The Queensland government, through the Department of Commercial and Industrial Development, offers a broad range of incentives to manufacturing and processing industries. Assistance is available with land, factory buildings, finance, freight, technical and other services.

Descriptors: aquaculture; financing

Geographic Descriptors: Australia, Queensland

65

Land tenure and aquaculture projects.

Lee, A.

(Dep. of Lands, Brisbane, Qld., Australia)

Pollock, B.R.; Quinn, R.H. [eds.]

Source: Seminar on the Potential of Aquaculture in Queensland, Brisbane (Australia), 24-25 March 1983.

CONF. WORKSHOP SER. DEP. PRIMARY IND. (QUEENSL.), no. QC83012. THE POTENTIAL OF AQUACULTURE IN QUEENSLAND. PROCEEDINGS OF THE SEMINAR HELD AT THE PROFESSIONAL DEVELOPMENT CENTRE, BRISBANE, 24-25 MARCH 1983. 1984, pp. 170-173.

Languages: English

Document Type: Conference; Book

ASFA Number: 115-18067

Abstract:

The Land Administration Commission (LAC) has authority to administer crown land, not freehold land, in Queensland under powers described in the Land Act 1962-1982. On receipt of an application for the use of crown land for aquaculture purposes, the LAC will seek the views of relevant authorities, e.g., Department of Harbours and Marine, Fisheries Branch, Local Authority, etc. Other factors such as the environmental and socioeconomic effects of the proposal would also be considered. In order to

Abstract (cont.):

grant a priority of use of the land to the applicant, the LAC would need to be convinced of the viability of the proposal. Estimates of the benefits of the proposal, the availability of finance, a timetable of development and other relevant factors should be presented. If the application were approved, then a lease would be issued. This may be a Special Lease as described under Section 198 to 213 of the Land Act. Land below high water mark would be leased by the Department of Harbours and Marine under their legislation.

Descriptors: aquaculture regulations; legislation

Geographic Descriptors: Australia, Queensland

66

Especies de thonides d'interet commercial pour l'aquaculture en Mediterranee.

(Tuna species of potential interest for fish culture in the Mediterranean Sea.)

Le Gall, J.Y.

(CNEXO, COB, BP 337, 29273 Brest Cedex, France)

Source: Presented at: Working Group on Biology, Fisheries, and Potential Aquaculture of Mediterranean Tunas, Sete (France), 9 May 1979. LE THON ROUGE EN MEDITERRANEE. BIOLOGIE PECHE ET AQUACULTURE, CNEXO PARIS (FRANCE), 1979, pp. 215-217.

Languages: French

Summary Languages: English; French

Document Type: Conference; Book

ASFA Number: 110-05157

Abstract:

Bluefin tuna, *Thunnus thynnus*, is particularly concerned in the project of tuna rearing in the Mediterranean Sea. However there are no reasons to neglect the other tuna species of the Mediterranean Sea which present an interesting material for the development of the research on tuna cultivation.

Geographic Descriptors: MED

Taxonomic Descriptors: Thunnidae

Environment: Marine

Identifiers: marine aquaculture; *Thunnus thynnus*

67

Inventaire des sites potentiels pour l'aquaculture sur le littoral du Finistere. Fasc. 2: Aquaculture traditionnelle.

(Survey of potential sites for aquaculture on the Finistere littoral. Part 2: Traditional aquaculture.)

Leglise, M.; Ragueneas, G.

(Institut Scientifique et Technique de Peches Maritimes, Nantes (France))

Source: [unknown], August 1978, 38 pp.

Languages: French

Document Type: Report

ASFA Number: 110-14734

Abstract:

This is the second part of a report about the Finistere littoral from the point of view of the environment and the management of resources for aquaculture. Current projects in fish and shellfish culture are described and new sites for oyster and seaweed culture are discussed. Certain important environmental factors: temperature and salinity of the seawater, water quality, industrial pollution and the nature of the substrate are studied.

Descriptors: aquaculture development; environmental surveys

Geographic Descriptors: France, Finistere

Environment: Marine

Identifiers: resource management; littoral zone; fishery resources; oyster culture; shellfish culture; seaweed culture; site selection

68

Preliminary studies on the aquaculture potential of the Pacific coast purple-hinge rock scallop.

Leighton, D.L.; Phleger, C.F.

(San Diego State Univ., San Diego, CA 92182, USA)

Source: Proceedings of the Seventh Annual Meeting of the World Mariculture Society held at San Diego, California January 25-29, 1976 in cooperation with San Diego State University and Syntex. World Mariculture Society, Charleston, SC, USA. Louisiana State University. Division of Continuing Education, Baton Rouge, LA (USA), 1976, p. 21

Document Type: Conference; Book

ASFA Number: 109-03463

Abstract:

Experimental culture of the Pacific rock scallop (*Hinnites multirugosus*) has shown the optimal temperature range for larvae to be 14-18 degrees C. Best growth of larvae was observed on single algal diets. Other aspects of the investigations under way are briefly mentioned.

Geographic Descriptors: INE, California

Taxonomic Descriptors: *Hinnites multirugosus*

Environment: Marine

Identifiers: aquaculture development; marine aquaculture

69

The economic and market potential for hybrid bass aquaculture in estuarine waters: A preliminary evaluation.

Liao, D.S.

(Mar. Resour. Div., South Carolina Wildl. Mar. Resour. Dcp., P.O. Box 12559, Charleston, SC 29412, USA)

Source: 16. Annu. Meet. of the World Mariculture Society Orlando, FL (USA), 13 January 1985.

J. WORLD MARICULT. SOC., (1986), vol. 16, pp. 151-157.

Languages: English

Document Type: Conference; Journal Article

ASFA Number: 117-15351

Abstract:

The costs and returns of hybrid bass (*Morone saxatilis* x *M. chrysops*) aquaculture were evaluated based on experimental production data in South Carolina. The market potential for hybrid bass was examined based on market price and volume of striped bass on the east coast during the past two decades. This preliminary assessment indicates that the economic outlook of commercial aquaculture of hybrid bass in estuarine waters appears promising. With current technology, prices in the \$5.50/kg or higher range would generate some profits for aquafarms. However, the major concern at present is legal restrictions on commercial production and marketing of hybrid bass in South Carolina.

Descriptors: brackish water aquaculture; fish culture; hybrid culture; aquaculture economics; experimental culture; estuaries

Geographic Descriptors: USA, South Carolina

Taxonomic Descriptors: *Morone saxatilis*; *Morone chrysops*

Environment: Marine; Brackish; Fresh

70

Market analysis for crawfish aquaculture in South Carolina.

Liao, D.S.

(Mar. Resour. Div., South Carolina Wildl. Mar. Resour. Dep., P.O. Box 12559, Charleston, SC 29412, USA)

Source: 15. Annu. Meet. of the World Mariculture Society Vancouver, B.C. (Canada), 1984.

J. WORLD MARICULT. SOC., (1984), vol. 14, pp. 106-107.

Languages: English

Document Type: Conference; Journal Article

ASFA Number: 116-14988

Abstract:

A study was undertaken to analyze consumer acceptance and market outlets for South Carolina-produced crawfish. Data, collected via mail surveys, indicate high acceptability for farm-raised crawfish. It is concluded that additional market research should focus on assessing potential market outlets, promotion, product packaging and marketing costs, etc.

Descriptors: crayfish culture; marketing

Geographic Descriptors: USA, South Carolina

Taxonomic Descriptors: *Procambarus clarkii*

Environment: Fresh

71

Studies on the feasibility of red tilapia culture in saline water.

Liao, I.C.; Chang, S.L.

(Tungkang Mar. Lab., Tungkang, Pingtung 916, Taiwan)

Fishelson, L.; Yaron, Z. [comps.]

Source: 1. Int. Symp. on Tilapia in Aquaculture, Nazareth (Israel), 8 May 1983. INTERNATIONAL SYMPOSIUM ON TILAPIA IN AQUACULTURE, NAZARETH, ISRAEL, 8-13 MAY 1983.

PROCEEDINGS. (no date), pp. 524-533.

Languages: English

Document Type: Conference; Numerical Data; Book

ASFA Number: 116-05762

Abstract:

Having a glorious reddish coloration and lacking black peritoneum, red tilapia (*Oreochromis* sp.) are very similar to the precious sea bream (*Chrysophrys major*). The aim of this study is to evaluate the feasibility of red tilapia culture in saline water. Red tilapia were cultured separately in seawater (34 ppt), brackish water (17 ppt) and fresh water (1.5-2.0 ppt) for comparison. In mixsex rearing experiment, the results showed that the red tilapia reared in brackish and seawater grew later than those reared in fresh water. But in all male rearing experiment, the best growth was obtained from the fish reared in fresh water. The results also showed that the variation of body weight from saline water was larger than that from freshwater. The territoriality and mating behavior probably cause the differences in growth among the fish reared in three different salinity of waters. The only disadvantage for the red tilapia cultured in saline water is that they are easily bruised, and attacked by fish lice resulting in a loss of appetite and even death. However, disinfection treatment after handling for measurements will reduce this symptom. Considering the above fact, red tilapia can be cultured in saline water satisfactorily. A project for culturing red tilapia in shallow sea or in cages in sea bay should show promise.

Descriptors: fish culture; marine aquaculture; aquaculture systems

Taxonomic Descriptors: *Oreochromis*; feasibility studies

Environment: Marine; Brackish

72

Studies on the growth and aquaculture potential of green mussel Perna viridis in Brunei waters.

Lindley, R.H.; Currie, D.J.

Beales, R.W.; Lindley, R.H. [eds.]

Source: MONOGRAPHS OF THE BRUNEI MUS. J., no. 5, INVESTIGATIONS INTO FISHERIES RESOURCES IN BRUNEI. 1982, pp. 125-133.

Languages: English

Document Type: Book

ASFA Number: 114-17148

Abstract:

As part of the Brunei Fisheries Department's program to examine the potential for mariculture in Brunei's estuarine waters, investigations into the growth of the Green Mussel *Perna viridis* (an exotic species) were carried out between November 1979 and August 1980. Spat imported from Singapore were found to have satisfactory growth characteristics using suspended rope culture techniques at two sites near Muara Port, Brunei. Commercially-sized mussels could be produced using the imported 20-mm spat in 4-5 months, but many problems remain before a viable culture industry based on mussels could be established. The absence of natural spatfall and the occurrence of toxic plankton blooms might preclude any large-scale development.

Descriptors: mussel culture; aquaculture development

Geographic Descriptors: ISEW, Brunei

Taxonomic Descriptors: *Perna viridis*

Environment: Brackish

73

Culture of barramundi and other estuarine and freshwater fish.

MacKinnon, M.R.

(Fish. Res. Branch, Dep. Primary Ind., Brisbane, Qld., Australia)

Pollock, B.R.; Quinn, R.H. [eds.]

Source: Seminar on the Potential of Aquaculture in Queensland, Brisbane (Australia), 24-25 March 1983.

CONF. WKSHP. SER. DEP. PRIMARY IND. (QUEENSL.) no. QC83012. THE POTENTIAL OF AQUACULTURE IN QUEENSLAND. PROC. OF THE SEM. HELD AT THE PROF. DEVEL. CENT., BRISBANE, 24-25 MARCH 1983. 1984, pp. 56-70.

Languages: English

Document Type: Conference; Book

ASFA Number: 115-18134

Abstract:

Techniques developed in Thailand for *Lates calcarifer* culture are outlined and used as a basis for estimating the aquaculture potential in Queensland. Fry production and grow-out culture are described and the culture of other estuarine and freshwater fish are also considered.

Descriptors: brackish water aquaculture; freshwater aquaculture; fish culture; aquaculture techniques

Geographic Descriptors: Australia, Queensland

Taxonomic Descriptors: *Lates calcarifer*

Environment: Brackish; Fresh

74

The potential impact of fish culture on wild stocks of Atlantic salmon in Scotland.

Maitland, P.S.

(Inst. Terr. Ecol., Bush Estate, Edinburgh, UK)

Jenkins, D.; Shearer, W.M. [eds.]

Source: ITE Symposium No. 15: The Status of the Atlantic salmon in Scotland, Kinkardineshire (UK), 13-14

February 1985. INST. TERR. ECOL. SYMP., no. 15, THE STATUS OF THE ATLANTIC SALMON IN SCOTLAND. 1986, pp. 73-78.

Languages: English

Document Type: Conference; Book

ISBN: 0-904282-92-9

ASFA Number: 116-16194

Abstract:

The various ways of culturing the Atlantic salmon are reviewed, with particular reference to their impact on wild stocks in Scotland. There are three main types of objective in culture: enhancement, ranching, and farming. Salmon-farming has been a spectacular success in recent years, whereas ranching is still at the experimental stage. Enhancement, though it has been widely practised for many decades, is of uncertain value and, though it may have given benefits in some systems, it could have caused damage in others.

Descriptors: fish culture; ranching; stocking (organisms)

Geographic Descriptors: ANE, British Isles, Scotland

Taxonomic Descriptors: *Salmo salar*

Environment: Marine; Fresh

Identifiers: British Isles, Scotland

75

Inventaire des sites potentiels pour l'aquaculture sur le littoral du Finistere. Fasc. 1: Aquaculture nouvelle.

Survey of the potential sites for aquaculture on the Finistere littoral. Part 1: New aquaculture.

Merceron, M.; Jegou, A.M.; Couteaux, B.; Piriou, J.Y.

(Cent. Oceanol. Bretagne, BP 337, 29273 Brest Cedex, France)

Source: [unknown], August 1978, 98 pp.

Languages: French

Document Type: Bibliography; Report

ASFA Number: 110-14733

Abstract:

A description of the Finistere littoral is presented. The following aspects are considered: hydrology, geomorphology, bathymetry and the developmental axes. The current state of new and traditional aquaculture in the region is discussed. Environmental parameters are considered from the point of their importance in aquaculture. 148 sites have been selected for aquaculture but further investigations are necessary to determine their respective advantages.

Descriptors: aquaculture development; environmental surveys; site selection

Geographic Descriptors: France, Finistere

Environment: Marine

Identifiers: habitat improvement; littoral zone; hydrology; bathymetry; resource management; sociological aspects; charts

76

Development and potential in the area of marine fin fish farming.

Moeller, D.

(Inst. Mar. Res., Sect. Aquaculture, Bergen, Norway)

Noel, S. [ed.]

Source: 1. Int. Fish Farming Conf., U.K., Brighton (UK), 17 March 1981. PROCEEDINGS OF THE FIRST INTERNATIONAL FISH FARMING CONFERENCE, U.K., MARCH 17-19, 1981, BRIGHTON, ENGLAND. (1982), pp. 19-26.

Languages: English

Document Type: Conference; Book

ASFA Number: 114-02094

Abstract:

Marine finfish-farming is discussed in detail. When selecting a locality for finfish-farming in inshore waters the following parameters should be investigated: temperature, salinity, oxygen, nutrients, pollution, water exchange, stratification and topography. The growth and economic output of the fish-farming industry will depend on the ability to control the reproduction of those marine finfish suitable for farming. An intensive cod-rearing project in Norway is outlined briefly. Prospects for marine finfish-farming in the future are bright, but serious problems have to be overcome before it can be more than a small supplement to the traditional fisheries.

Descriptors: fish culture; marine aquaculture; aquaculture development

Environment: Marine

77

The potential for brackish water fish farming in Orissa.

Mohanty, S.K.

(All-India Co-ordinated Proj., Jeypore, Koraput, Orissa, India)

Source: Seafood Export J., (1977), vol. 9(4), pp. 13-17.

Document Type: Journal Article

ASFA Number: 108-06125

Abstract:

Orissa has vast areas of coastal tracts, brackish water lakes, and estuarine swamps, which is roughly estimated to extend to over 0.08 lakh ha (20,000 acres) or approx 1.13% of the total available brackish water areas in the east coast of India. Utilization of this space through proper development and management would increase yield from the brackish water area as well as introduce an element of systematization and control that would result in a higher potential production. The main areas of research presently being followed are noted, and a brief account is given of the Chilka lake fisheries development project. The possibility of using a variety of fish and shrimp species in monoculture and polyculture is outlined.

Descriptors: aquaculture development; brackish water aquaculture; potential yield

Geographic Descriptors: India, Orissa

Environment: Brackish

Identifiers: fish culture; crustacean culture

78

Aquaculture of marron, Cherax tenuimanus (Smith). Part 1. Site selection and the potential of marron for aquaculture.

Morrissy, N.M.

(Western Aust. Mar. Res. Lab., P.O. Box 20, North Beach, WA 6020, Australia)

Source: Western Australia Department of Fisheries and Wildlife, Perth (Australia). Fish. Res. Bull. Dep. Fish. Wildl. (West. Aust.), (no. 17), [no date or pages given].

Languages: English

Document Type: Book

ASFA Number: 109-03554

Abstract:

The two important criteria for optimal site selection in pond aquaculture of marron, *C. tenuimanus*, are: (1) the maintenance of a rapid-growth schedule both over winter and over summer, and (2) an assurance of a low probability of sudden mass mortality due to adverse summer weather. Previous growth studies on wild populations and a 5-year laboratory comparison of growth rates at low (natural) and artificially elevated water temperatures over winter, showed that growth ceased for about 4 months each year when water temperatures fell below 12-13 degrees C. During summer, growth may be greatly depressed, or in extreme cases mass mortalities may occur, due to prolonged oxygen deficiencies in the bottom water over detrital food supplies. In deep unshaded turbid ponds and dams a steep thermal stratification develops by midafternoon each day during hot weather when extremes of surface water temperatures, of from 33 degrees to 36 degrees C, have been recorded in different dams. While marron may thus escape any thermal stress (6-hour survival time = 33.5 degrees C at an acclimation temperature of 24 degrees C), some degree of thermal layering may persist sufficiently during the overnight cooling period each day to prevent oxygen replenishment, i.e., mixing of surface and bottom

Abstract (cont.):

waters. The temperature climate over the southwest of Western Australia and predictions of water temperatures at various localities were examined for optimal winter and summer conditions. The most suitable locality is the extreme southwest near Cape Leeuwin where the dominating oceanic influence over weather promotes the highest winter temperatures and the lowest daily and yearly temperature variations. This locality is also indicated from the general ecological theory of the distribution and abundance of animals proposed by Andrewartha and Birch since it lies at the center of the natural distribution of marron.

Descriptors: pond culture; crustacean culture; aquaculture development; freshwater aquaculture

Geographic Descriptors: Australia

Taxonomic Descriptors: *Cherax tenuimanus*

Environment: Fresh

79

Aspects du developpement des peches au Malawi et son impact economique potentiel sur l'economie rurale.

(Aspects of fish culture development in Malawi and its potential economic impact on a rural economy.)

Msiska, O.V.

(Fish. Dep., P.O. Box 44, Domasi, Malawi. FAO, Rome (Italy))

Kapetsky, J.M. [ed.]

Source: Seminar on River Basin Management and Development, Blantyre (Malawi), 8 December 1980.

SEMINAR ON RIVER BASIN MANAGEMENT AND DEVELOPMENT, BLANTYRE, MALAWI, 8-10 DECEMBER 1980. PAPERS PRESENTED. 1981, pp. 292-302.

CIFA TECH. PAP. DOC. TECH. CPCA., no. 8. SEMINAIRE SUR L'AMENAGEMENT ET LA MISE EN VALEUR DES BASSINS FLUVIAUX, BLANTYRE, MALAWI, 8-10 DECEMBRE 1980.

DOCUMENTES PRESENTES.

Languages: English

Summary Languages: English; French

Document Type: Conference; Book

ASFA Number: 113-09022

Report No.: FAO CIFA/T8

Abstract:

Fish culture is an important potential source of dietary protein in Malawi, and may supplement the natural fishery. A partial budget analysis shows that fish culture may also be a source of subsistence income. The costs of pond construction, stocking material, feeds and fertilizers (or manures) significantly influenced economic returns. Pond construction with the use of ox-drawn scoops and scrapers may minimize costs. Some form of horizontal integration to include agricultural crops, livestock and fish may offer an ideal strategy in a rural economy. Possibilities for commercial fish production exist in Malawi, especially when using a polyculture system of *Cyprinus carpio* and *Sarotherodon* (or *Tilapia*) spp.

Descriptors: fish culture; aquaculture development; aquaculture economics

Geographic Descriptors: Malawi

Environment: Fresh

Socialist People's Libyan Arab Republic. Marine aquaculture development, Zawia. A report prepared for the feasibility of Marine Farming (phase 2).

Muir, J.; Berg, L.

Source: FAO, Rome (Italy), 1987, 53 pp.

Languages: English

Document Type: Numerical Data; Report

Report Number: FAO FI/DP/LIB/86/002-field-doc-1.

ASFA Number: 117-16944

Abstract:

The Zawia marine aquaculture project is to be established in a section of the former Zawia quarry workings and is designed to produce seabass, sea bream, and possibly tilapia under modern, intensive raceway conditions. The accompanying diagrams show the proposed layouts. As presently proposed, the project will be developed in two major phases, the first of which would be scheduled to start by early 1987, with initial stocks of fish being introduced in spring (May) 1987, for production as market-size fish by late summer 1988. Further stocks of fish will be produced in the hatchery from early 1988 and will support the expansion of production in the longer term. The use of tilapia may permit a more rapid development of production. The physical development of the project will be accompanied by intensive staff training. Conditions in the area should be generally very favorable for marine aquaculture, and the project as proposed will be one of the largest and most technically advanced of its type in the Mediterranean region.

Descriptors: marine aquaculture; fish culture; aquaculture development; raceway culture

Geographic Descriptors: Libya, Zawia

Environment: Marine

Selección de sitio manejo hidráulico.

(Site selection and hydraulic management of aquaculture).

Munoz Esquerria, J.

Source: Segundo Simposio Latinoamericano de Acuicultura, Mexico City, Mexico, 13 noviembre 1978.

MEMORIAS DEL SEGUNDO SIMPOSIO LATINOAMERICANO DE ACUACULTURA.

(MEMOIRS OF THE 2d LATIN AMERICAN SYMPOSIUM ON AQUACULTURE).

1980, vol. 1, pp. 2305-2323.

Languages: Spanish

Document Type: Conference; Book

ASFA Number: 114-02066

Abstract:

The site selection and the hydraulic management for aquaculture are discussed. The basic factors for site selection are water (supply sources, quality), terrain (communication facilities, bioecologic conditions, topography, structural condition, ownership, value), and climate. Some other aspects are raw materials, location, labor, industrial fuel availability, transport facilities, market, distribution facilities, energy, life conditions, laws and regulations, tax structure. For the hydraulic management the principal factor is the cultured species, which in turn depend on operational needs, water type in use, and terrain availability and topography. A hydraulic project for the culture of prawns is presented.

Descriptors: aquaculture development; hydraulic engineering; site selection; aquaculture facilities

Environment: Fresh

Potencial de la lisa Mugil curema (C.V.) pez comercial eurihhalino para la acuacultura.

Potential of *Mugil curema*, an euryhaline commercial fish, for aquaculture.

Murillo, A.

(Univ. Valle, Carrera 5a., No. 36-57, Cali, Colombia)

Source: Simposio sobre Sistemas de Acuacultura para Colombia Manizales, Colombia, 24 agosto 1983. SER.

MEM. EVENTOS CIENT. COLOMBIANOS., (1984), no. 9, pp. 129-131.

Languages: Spanish

Document Type: Conference; Journal Article

ASFA Number: 115-14007

Abstract:

The potential for aquaculture of *M. curema* is discussed. Its distribution, juvenile availability (from January to July, mean size 20-30 mm), transport (in plastic bags, 3 parts of oxygen per part of water, 28 degrees C, for a period of up to 4 hours), growth (and length-weight relationships, robustness index $K = w/l \times 100$, which varies from 1.2 to 2.2), feeding (foraging species, stomach content studies showed Rhodophyta and detritus, juveniles have been reared with an artificial diet of toasted shrimp and vegetables processed as pellets and then powdered for consumption), environmental tolerance (withstands salinities between 0 and 20 ppt., has a prethermal adaptation), parasites and diseases (from 659 individuals analyzed, only 2 had trematode parasites) are discussed.

Descriptors: fish culture; potential resources; parasites; length-weight relationships; feeding behavior; tolerance

Taxonomic Descriptors: *Mugil curema*

Environment: Marine; Brackish; Fresh

Site selection and types of farms for coastal aquaculture of prawns.

Muthu, M.S.

(Cent. Mar. Fish. Res. Inst. Cochin 18, India)

Source: Short Term Training Programme in Brackish Water Prawn and Fish Culture, Kakinada (India), 8 September 1980. SHORT-TERM TRAINING PROGRAMME IN BRACKISH WATER PRAWN AND FISH CULTURE, SEPTEMBER 8-30, 1980, AT BRACKISH WATER FISH FARM, BEACH ROAD, KAKINADA-7, 1981, pp. 19-30.

Languages: English

Document Type: Conference; Book

ASFA Number: 113-09109

Abstract:

Criteria considered important in the selection of a site for prawn farm construction are listed as: 1) topography and tidal regime of the area, 2) soil characteristics, 3) water characteristics, 4) availability of the natural seed resources in the areas, 5) the flora and fauna of the region, 6) freedom from pollution, 7) accessibility and nearness to markets, 8) legal regulations, 9) socioeconomic conditions of the locality. The construction and maintenance of a farm are discussed and the types of prawn farms in India outlined.

Descriptors: pond culture; site selection; shrimp culture; brackish water aquaculture

Geographic Descriptors: India

Taxonomic Descriptors: Penaeidae

Environment: Brackish

84

Aquaculture communiques: A global overview of aquaculture production.

Nash, Colin E.

Source: JOURNAL OF THE WORLD AQUACULTURE SOCIETY, June 1988, vol. 19 (2), pp. 51-58.

Languages: English

Document Type: Journal Article

85

Genetics in bivalve aquaculture: 1983 and still lots of potential.

Newkirk, G.F.

(Biol. Dep., Dalhousie Univ., Halifax, NS 1818, Canada)

Source: 14. Annual Meeting of the World Mariculture Society, Washington, DC (USA), 9 January 1983.

J. WORLD MARICULT. SOC., (1983), vol. 14, pp. 560-566.

Languages: English

Document Type: Conference; Journal Article

ASFA Number: 115-14145

Abstract:

To date genetics has made no significant impact on bivalve aquaculture. There have been obstacles to the implementation of selective breeding in bivalve culture, but the primary reason for so little progress must be a lack of a concerted effort to develop effective programs. However, there is evidence that more commercially valuable stocks can be obtained with controlled breeding programs. Different approaches to improvement include hybridization, induced polyploidy and mass selection. Mass selection has the most potential for immediate application to commercial breeding. Although no controlled selective breeding programs are known to exist in commercial bivalve hatcheries, selective breeding programs can be compatible with the operation of a commercial hatchery if the operators see genetics as an essential part of the complete husbandry of bivalve stocks.

Descriptors: mollusk culture; selective breeding

Taxonomic Descriptors: aquaculture development; Bivalvia

Environment: Marine; Brackish; Fresh

86

Local government involvement with aquaculture projects.

O'Connor, J.

(Dep. Local Gov., Qld., Australia)

Pollock, B.R.; Quinn, R.H. [eds.]

Source: Seminar on the Potential of Aquaculture in Queensland, Brisbane (Australia), 24-25 March 1983.

CONF. WORKSHOP SER. DEP. PRIMARY IND. (QUEENSL.), no. QC83012. THE POTENTIAL OF AQUACULTURE IN QUEENSLAND. PROCEEDINGS OF THE SEMINAR HELD AT THE PROFESSIONAL DEVELOPMENT CENTRE, BRISBANE, 24-25 MARCH 1983. 1984, pp. 174-177.

Languages: English

Document Type: Conference; Book

ASFA Number: 115-18068

Abstract:

The paper will refer to those aspects of a large-scale aquaculture proposal in which the local authority for the area would be interested. These will include matters specifically required under the Queensland Local Government Act such as Section 32A Environmental Impact and Section 33 Town Planning and also such matters as infrastructure requirements to service the development and management of flood water.

Descriptors: aquaculture regulations; environment management

Geographic Descriptors: Australia, Queensland

87

Availability of estuarine areas for aquaculture.

Olsen, H.F.

(Estuarine and Foreshore Manage. Sect., Dep. Primary Ind., Brisbane, Qld., Australia)

Pollock, B.R.; Quinn, R.H. [eds.]

Source: Seminar on the Potential of Aquaculture in Queensland, Brisbane (Australia), 24-25 March 1983.

CONF. WORKSHOP SER. DEP. PRIMARY IND. (QUEENSL.), no. QC83012. THE POTENTIAL OF AQUACULTURE IN QUEENSLAND. PROCEEDINGS OF THE SEMINAR HELD AT THE PROFESSIONAL DEVELOPMENT CENTRE, BRISBANE, 24-25 MARCH 1983. 1984, pp. 111-125.

Languages: English

Document Type: Conference; Book

ASFA Number: 115-18063

Abstract:

The estuarine inventory program initiated by the Department of Primary Industries in 1974 is outlined. The results of that program and the associated classification and priority ranking of estuarine systems is discussed. Current fisheries legislation is briefly documented and estuarine management options related to the inventory and classification program. Implementation by the fisheries manager of the resultant constraints imposed on aquaculture (and mariculture) projects is reviewed. That review is then summarized to show the availability of estuarine areas for this type of activity, specific constraints on their use and the conclusion that socioeconomic effects on existing fisheries are a critical factor in establishing the desirability or otherwise of aquaculture projects in estuarine areas.

Descriptors: brackish water aquaculture; fish culture; aquaculture systems; aquaculture regulations

Geographic Descriptors: ISEW, Australia, Queensland

Environment: Brackish

88

*New candidates with aquaculture potential in Washington State: Pinto abalone (*Haliotis kamtschatkana*), weathervane scallop (*Pecten caurinus*), and purple-hinge rock scallop (*Hinnites multingosus*).*

Olsen, S.

(WA Dept. Fish., Pt. Whitney Shellfish Lab., Brinnon, WA 98320)

Source: Annu. Meet. Nat. Shellfish Assoc., West Coast Section Tumwater, WA (USA), 5 September 1980.

J. SHELLFISH RES., (1981), vol. 1 (1), p. 133.

Languages: English

Document Type: Conference; Summary; Journal Article

ASFA Number: 114-04657

Abstract:

Three underutilized native species are being investigated for their commercial aquaculture and enhancement potential. These aquaculture candidates include the pinto abalone (*Haliotis kamtschatkana*) and two scallop species: the weathervane (*Pecten caurinus*) and the purple-hinge rock scallop (*Hinnites multirugosus*). An experimental minihatchery facility has been established at the Point Whitney Shellfish Laboratory, Brinnon, WA, and progress has been made in culturing the larvae of all three species. Spontaneous spawnings in May for the weathervane scallops, and in May and September for the purple-hinge rock scallop provided viable larvae for study, although all attempts to stimulate spawnings have been unsuccessful. Larvae of each species were cultured to metamorphosis in 34 to 40 days, at which time high mortality occurred. Larval scallops were grown in seawater filtered to 10 μ m at temperatures of 9 to 16 degrees C in static culture, and fed a mixture of *Monochrysis* sp., *Isochrysis* sp., and *Pseudoisochrysis* sp. at concentrations of 10,000 to 50,000 cells/ml.

Descriptors: mollusk culture; scallop culture

Geographic Descriptors: aquaculture development; INE, USA, Washington

Taxonomic Descriptors: *Haliotis kamtschatkana*; *Pecten caurinus*; *Hinnites multirugosus*

Environment: Marine

89

The economics of an aquaculture project (Macrobrachium rosenbergii) in Queensland.

Pashen, A.J.

(Fish. Res. Branch, Dep. Primary Ind., Brisbane, Qld., Australia)

Pollock, B.R.; Quinn, R.H. [eds.]

Source: Seminar on the Potential of Aquaculture in Queensland, Brisbane (Australia), 24-25 March 1983.

CONF. WORKSHOP SER. DEP. PRIMARY IND. (QUEENSL.), no. QC83012. THE POTENTIAL OF AQUACULTURE IN QUEENSLAND. PROCEEDINGS OF THE SEMINAR HELD AT THE PROFESSIONAL DEVELOPMENT CENTRE, BRISBANE, 24-25 MARCH 1983. 1984, pp. 187-198.

Languages: English

Document Type: Conference; Book

ASFA Number: 115-18301

Abstract:

Some of the aspects which aquaculturists need to address before setting up a project are considered. There are a variety of factors which will affect the economics of an aquaculture project, e.g., the site selected will determine the construction costs of ponds, the availability and cost of pumping water, access to markets, etc. A practical example is given of the capital costs involved in setting up and 8-hectare farm rearing postlarval giant freshwater prawns (*M. rosenbergii*) and the typical annual income and costs. At least \$250,000 would be required as startup capital for a project of this size. After 2 or 3 years of operation an annual yield of 900 kg/pond is obtainable. At this production level the break-even price of prawns was estimated to be \$9.68/kg. Freshwater prawns would not be able to compete favorably with saltwater prawns at this price.

Descriptors: prawn culture; aquaculture economics

Geographic Descriptors: Australia, Queensland

Taxonomic Descriptors: *Macrobrachium rosenbergii*

Environment: Fresh

An experiment on aquaculture potential of Atlantic salmon, Salmo salar L., kelts in Newfoundland, Canada.

Pepper, V.A.; Parsons, P.

(Dep. Fish. and Oceans, P.O. Box 5667, St. John's, Nfld., Canada A1C 5X1)

Source: AQUACULT. FISH. MANAGE., (1987), vol. 18 (4), pp. 327-344.

Document Type: Journal Article

ASFA Number: 119-01648

Abstract:

Postspawning Atlantic salmon, *Salmo salar* L., were obtained from a salmon enhancement project in the autumn of 1984. These salmon were overwintered in submerged cages in fresh water, retrieved in the spring of 1985, and transferred to a marine cage after vaccination for *Vibrio anguillarum*. Salmon mortality was highest immediately after their retrieval from overwintering cages. Mortality through the duration of the marine cages interval was 0 multiplied by 22% each day. Growth reached a maximum of 1 multiplied by 76% per day. Average final weight of reconditioned kelt (after 101 days of marine cage confinement) was greater than the average weight of natural repeat spawners in the stock that provided kelt to the aquaculture experiment. Consumer response to the reconditioned kelt indicated that flesh color was inferior but that the products were acceptable and that 84% of the consumers polled would purchase the product again.

Descriptors: fish culture; vaccination; kelt; experimental culture

Geographic Descriptors: ANW, Canada, Newfoundland

Taxonomic Descriptors: *Salmo salar*

Environment: Marine; Fresh

Identifiers: reconditioned kelt

Selección física de sitios para la construcción de centros acuícolas.

Physical site selection for the construction of aquaculture centers.

Perez Mendoza, M.

(Dep. Pesca, Dir. Gen. de Infraestructura Pesq., Mexico City, Mexico)

Source: Segundo Simposio Latinoamericano de Acuicultura, Mexico City, Mexico, 13 November 1978.

MEMORIAS DEL 2. SIMPOSIO LATINOAMERICANO DE ACUACULTURA. (MEMOIRS OF THE 2d LATIN AMERICAN SYMPOSIUM ON AQUACULTURE.) 1980, vol. 1, pp. 2827-2832.

Languages: Spanish

Document Type: Conference; Book

ASFA Number: 114-02076

Abstract:

The physical site selection for aquaculture centers in Mexico is discussed. Several factors must be taken into account for site selection: physical factors (terrain, soil mechanics studies, existing infrastructure facilities, availability of electric energy, land ownership, water resources), biological factors, and socioeconomic factors (economic condition of the community, its alimentary habits, etc.).

Descriptors: aquaculture facilities; site selection

Geographic Descriptors: Mexico

Environment: Fresh

Estuarine fish as candidates for aquaculture in Queensland.

Pollock, B.R.

(Fish. Res. Branch, Dep. Primary Ind., Brisbane, Qld., Australia)

Pollock, B.R.; Quinn, R.H. [eds.]

Source: Seminar on the Potential of Aquaculture in Queensland, Brisbane (Australia), 24-25 March 1983.

CONF. WORKSHOP SER. DEP. PRIMARY IND. (QUEENSL.), no. QC83012. THE POTENTIAL OF AQUACULTURE IN QUEENSLAND. PROCEEDINGS OF THE SEMINAR HELD AT THE PROFESSIONAL DEVELOPMENT CENTRE, BRISBANE, 24-25 MARCH 1983. 1984, pp. 103-109.

Languages: English**Document Type:** Conference; Book**ASFA Number:** 115-18136**Abstract:**

Estuarine fish make up the largest part of the finfish catch in Queensland, hence these fish have the potential for aquaculture. The juvenile and adult fish use estuaries as feeding areas. At certain times of the year, adult fish migrate towards the sea to spawn. After hatching the postlarvae or young juveniles return to estuarine areas. Fish with this lifecycle include barramundi, mullet, bream, luderick, bass and possibly flathead and whiting. The complex lifecycle of estuarine fish poses problems for the would-be aquaculturist in Queensland. Some technical problems with holding and feeding the early stages are yet to be solved. The larval and postlarval stages of estuarine fish have very specific requirements in relation to food and water quality. The main options for aquaculture of estuarine fish in Queensland are: to culture the fish from egg stage to trap wild postlarvae in ponds and to collect wild juveniles to stock ponds or cages.

Descriptors: brackish water aquaculture; fish culture; aquaculture systems**Geographic Descriptors:** Australia, Queensland**Environment:** Brackish*The potential of aquaculture in Queensland.*

Pollock, B.R.; Quinn, R.H. [eds.]

(Queensland Dep. of Primary Industries, Brisbane (Australia))

Source: Proceedings of the Seminar held at the Professional Development Centre, Brisbane, 24-25 March 1983.

Seminar on the Potential of Aquaculture in Queensland, Brisbane (Australia), 24 March 1983. CONF.

WKSHP. SER. DEP. PRIMARY IND. (QUEENSL.), no. QC834012. 1984, 218 pp.

Languages: English**Document Type:** Conference; Book**ISSN:** 0728-067X**ASFA Number:** 151-8061**Abstract:**

(Abstracts of the 20 papers are cited in this issue.)

Descriptors: aquaculture development; conferences**Geographic Descriptors:** Australia, Queensland

Mollusk culture in Queensland.

Potter, M.

(Fish. Res. Branch, Dep. Primary Ind., Brisbane, Qld., Australia)

Pollock, B.R.; Quinn, R.H. [eds.]

Source: Seminar on the Potential of Aquaculture in Queensland, Brisbane (Australia), 24-25 March 1983.

CONF. WORKSHOP SER. DEP. PRIMARY IND. (QUEENSL.), no. QC83012. THE POTENTIAL OF AQUACULTURE IN QUEENSLAND. PROCEEDINGS OF THE SEMINAR HELD AT THE PROFESSIONAL DEVELOPMENT CENTRE, BRISBANE, 24-25 MARCH 1983. 1984, pp. 47-55.

Languages: English**Document Type:** Conference; Book**ASFA Number:** 115-18286**Abstract:**

The present status of the Queensland pearl culture and oyster culture industries are reviewed. Principal cultivation methods currently in use are described. Existing disease problems and their implications for their respective industries are considered. It is concluded that there may be some potential for expansion of the North Queensland pearl culture industry; however, in the present circumstances the prospects for any significant expansion of the oyster industry are poor. Exotic and endemic species with possible aquacultural potential in Queensland are briefly discussed.

Descriptors: mollusk culture; pearl culture; oyster culture; aquaculture techniques**Geographic Descriptors:** Australia, Queensland**Taxonomic Descriptors:** *Pinctada maxima*; *Saccostrea commercialis***Environment:** Marine*Investigations into the feasibility of a duck-fish-vegetable integrated agriculture-aquaculture system for developing areas in South Africa.*

Prinsloo, J.F.; Schoonbee, H.J.

(Limnol. Res. Unit, Univ. North, Private Bag X1106, Sovenga 0727, South Africa)

Source: WATER S.A., (1987), vol. 13 (2), pp. 109-118.**Languages:** English**Document Type:** Journal Article**ASFA Number:** 117-12067**Abstract:**

The production potential of a duck-fish-vegetable integrated aquaculture-agriculture farming system was investigated. Pekin ducks were used which were first grown indoors for a period of 28 days before being released into enclosed fishponds with shelters over the pond water. Manure and waste feed were dropped directly into the water containing fish in polyculture which included the European common carp, *C. carpio*, the bighead carp *A. nobilis*, silver carp, *H. molitrix* and the grass carp, *C. idella*. Only the common carp received predetermined quantities of supplementary feed based on growth, by means of demand feeders, as other species largely utilized the nutrients discharged into the ponds with the feces of the ducks as well as plankton growths which developed as a result. The nutrient-rich water in the ponds was used to irrigate vegetable crops. Ducks grew to an average of 2.65 kg in a period of 55-56 days. Fish yields obtained exceeded 8 t ha super(-1) over a period of 149 days. Substantial yields of vegetable crops were obtained with vegetables such as tomatoes, spinach and lettuce clearly benefiting from the nutrient-rich water.

Descriptors: feasibility studies; aquaculture; agropisciculture; nutrients (mineral)

Geographic Descriptors: South Africa

Taxonomic Descriptors: *Cyprinus carpio*; *Aristichthys nobilis*; *Ctenopharyngodon idella*; *Hypophthalmichthys molitrix*

Environment: Fresh

Identifiers: agriculture

96

The current state and potential of shellfish culture.

Purdom, C.

(MAFF, Dir. Fish. Res., UK)

Noel, S. [ed.]

Source: 1. Int. Fish Farming Conf. U.K., Brighton (UK), 17 March 1981. PROCEEDINGS OF THE FIRST INTERNATIONAL FISH FARMING CONFERENCE, U.K., MARCH 17-19, 1981, BRIGHTON, ENGLAND, IN ASSOCIATION WITH THE FIRST INTERNATIONAL FISH FARMING EXHIBITION, U.K. (1982), pp. 27-36.

Languages: English

Document Type: Conference; Book

ASFA Number: 114-02185

Abstract:

World production levels, capture and culture of fish, crustaceans and mollusks are given. It is believed that capture rates cannot be increased. Oyster culture in the UK is discussed in detail. Research activities are currently concentrated on three main phases of production, namely hatchery, nursery and on-growing.

Descriptors: shellfish culture; oyster culture; aquaculture development

Geographic Descriptors: British Isles

Environment: Marine

97

Hybrid fish could have farm potential.

Purdom, C.; Thacker, G.

(MAFF Fish. Lab., Lowestoft, UK)

Source: FISH FARMER, 1980, vol. 3 (5), pp. 35-36.

Languages: English

Document Type: Journal Article

ASFA Number: 111-15974

Descriptors: aquaculture techniques; hybrid culture

Taxonomic Descriptors: Pisces

Identifiers: fish culture

The fishery for palaemonid species and the need and potential for their culture.

Rabanal, H.R.

(FAO/UNDP South China Sea Fisheries Dev. and Coord. Programme, P.O. Box 1184, MCC Makati, Metro Manila, Philippines)

New, M.B. [ed.]

Source: Giant Prawn 1980, Bangkok (Thailand), 15 June 1980. DEV. AQUAT. FISH. SCI., vol. 10. GIANT PRAWN FARMING. SELECTED PAPERS--"GIANT PRAWN 1980," AN INT. CONF. ON FRESHWATER PRAWN FARMING, BANGKOK, THAILAND, JUNE 15-21, 1980. 1982, pp. 309-331.

Languages: English

Document Type: Conference; Bibliography; Book

ISBN: 0-444-42093-2

ASFA Number: 113-1500

Abstract:

The fishery for palaemonid species in some countries of the world is described. The suitability for culture and the development of appropriate culture technology for one species, *Macrobrachium rosenbergii*, have been noted. In some countries where a commercial fishery used to exist, the gradual to rapid decline of such fishery due to manmade environmental changes has been observed. To save the industry and conserve this valuable resource, aquaculture, including mass production of prawn seeds through hatcheries and production of food crops in grow-out ponds, is imperative.

Descriptors: prawn culture; shrimp fisheries; aquaculture development

Taxonomic Descriptors: Palaemonidae; *Macrobrachium rosenbergii*

Potential for an aquaculture industry in Trinidad and Tobago.

Ramsaroop, D.

(Nat. Resour. Prog., Inst. Mar. Aff., Trinidad & Tobago)

Source: 34. Annu. Gulf and Caribbean Fisheries Institute Mayaguez, PR (USA), November 1981. PROC. GULF CARIBB. FISH. INST., no. 34, PROC. OF THE THIRTY-FOURTH ANNUAL GULF AND CARIBBEAN FISHERIES INSTITUTE, MAYAGUEZ, PUERTO RICO, NOVEMBER 1981. 1982, pp. 76-80.

Languages: English

Document Type: Conference; Book

ASFA Number: 113-14869

Abstract:

Aquaculture development in Trinidad and Tobago has been limited to tropical aquarium fish. Earlier attempts to develop a food production industry using tilapia failed due to a lack of sustained effort by the agencies concerned and poor marketing techniques. Aquaculture is rapidly becoming established as a viable industry in many areas of the world and especially in Third World countries. Also, agriculture is on the decline in Trinidad and Tobago. Recognizing this, the Institute of Marine Affairs, in cooperation with the Ministry of Agriculture, Lands and Food Production and the Zoology Department of the University of the West Indies, embarked on a strategy for introducing aquaculture as an acceptable and viable food production system in Trinidad and Tobago.

Descriptors: aquaculture development

Geographic Descriptors: Trinidad; Tobago

Environment: Marine

100

Development prospects for coastal aquaculture in the Mediterranean region: Energy potential of the natural environment.

Ravagnan, G.

(Cent. Ittiol. Valli Venete (CIVV), Ca Pisani, 1-4 5014 Contarina (RO), Italy)

Bilio, M.; Rosenthal, H.; Sindermann, C.J. [eds.]

Source: World Con. on Aquaculture, Venice, 21-25 September 1981. REALISM IN AQUACULTURE: ACHIEVEMENTS, CONSTRAINTS, PERSPECTIVES. 1986, pp. 59-76.

Languages: English

Document Type: Conference; Book

ISBN: 90-71625-01-X

ASFA Number: 117-12082

Abstract:

The author reviews climatic zones of the Mediterranean region, extensive brackishwater fish farming, different farming methods and potential production, integrated valliculture, and integrated valliculture model and production potential of integrated valliculture in the Mediterranean region.

Descriptors: marine aquaculture; brackish water aquaculture; fish culture; valliculture; aquaculture systems

Geographic Descriptors: MED

Environment: Marine; Brackish

101

Marine finfish farming: Some thoughts on New Zealand potential.

Ritchie, L.D.

(Fisheries Management Div., Minist. of Agriculture and Fisheries, Whangarei, New Zealand)

Dinamani, P.; Hickman, R.W. [comps.]

Source: Aquaculture Conference, Wellington (New Zealand), September 1979. OCCAS. PUBL. FISH. RES. DIV. MINIST. AGRIC. (N.Z.), no. 27, PROCEEDINGS OF THE AQUACULTURE CONFERENCE. 1980, pp. 57-63.

Languages: English

Document Type: Conference; Book

ASFA Number: 113-14907

Abstract:

The possibilities and problems associated with trying to farm several northern New Zealand fish species (flatfish, grey mullet, snapper, northern kingfish) are discussed. Observations made on Japanese fishfarms are presented and then related to prospects for snapper and kingfish culture in northern New Zealand waters.

Descriptors: fish culture; marine aquaculture

Geographic Descriptors: PSW, New Zealand

Environment: Marine

102

Overseas penaeid aquaculture examples in Japan and Ecuador.

Rothlisberg, P.C.

(CSIRO Div. Fish. Res., Australia)

Pollock, B.R.; Quinn, R.H. [eds.]

Source: Seminar on the Potential of Aquaculture in Queensland, Brisbane (Australia), 24-25 March 1983.
CONF. WKSHP. SER. DEP. PRIMARY IND. (QUEENSL.), no. QC83012. THE POTENTIAL
OF AQUACULTURE IN QUEENSLAND. (PROCEEDINGS) 1984, pp. 15-28.

Languages: English

Document Type: Conference; Book

ASFA Number: 115-18281

Abstract:

The Japanese founded modern, intensive, penaeid aquaculture practices over 40 years ago. Since then they have developed a variety of hatchery techniques to produce postlarvae for both restocking wild populations and supply to farms for adult grow-out. Virtually all the product is supplied to the live prawn market in Tokyo. In Ecuador traditional penaeid culture has been practised since the days of the Incas 400 years ago. In some areas procedures have changed little, still relying on tidally flushed ponds, wild-caught postlarvae, low stocking densities, no supplemental fertilization or feeding with relatively low yields. In recent times the scale of these operations has increased dramatically and more sophisticated operators using better pond management, supplemental feeding regimes and hatchery-produced postlarvae have increased production to approximately 3,000-4,000 kg/ha/yr. Total pond production in 1980 in Ecuador was similar to 10,000 tonnes from 30,000 ha of ponds. Specific examples of production techniques in each country are given and put in an Australian perspective.

Descriptors: shrimp culture; aquaculture techniques

Geographic Descriptors: INW, Japan; ISE, Ecuador

Taxonomic Descriptors: Penaeidae

Environment: Marine

103

Potential for aquaculture of South American freshwater fishes: A review.

Saint-Paul, U.

(Inst. Hydrobiol. und Fischereiwiss., Olbersweg 24, D-2000 Hamburg 50, FRG)

Source: AQUACULTURE., (1986), vol. 54 (3), pp. 205-240.

Languages: English

Document Type: Review; Journal Article

ASFA Number: 117-05842

Abstract:

The importance of aquaculture in South America is still relatively minor, and native fishes actually account for only a very small percentage of the production. That the contemporary aquaculture production can be significantly increased was shown by an analysis of the information obtained by culturing species belonging to 10 genera in the families Osteoglossidae, Anostomidae, Curimatidae, Serrasalminidae, Characidae, Pimelodidae, Atherinidae and Cichlidae. It is demonstrated that an extensive or semi-intensive cultivation of the omnivorous serrasalmids belonging to the genus *Colossoma* can make an important contribution to the nutrition of the rural population. The intensive cultivation of carnivorous species such as *Arapaima gigas* could be promising for larger scale commercial production.

Descriptors: aquaculture development; potential resources; literature reviews; freshwater aquaculture

Geographic Descriptors: South America

Taxonomic Descriptors: Osteoglossidae; Anostomidae; Curimatidae; Serrasalminidae; Characidae;

Pimelodidae; Atherinidae; Cichlidae; *Colossoma*; *Arapaima gigas*

Environment: Fresh

104

The potential of some Amazonian fishes for warm water aquaculture.

Saint-Paul, U.; Werder, U.

(Inst. Nacl. Pesq. Amazonia (INPA), Caixa Postal 478, BR-69.000 Manaus-AM, Brazil)

Tiews, K. [ed.]

Source: World Symposium on Aquaculture in Heated Effluents and Recirculation Systems, Stavanger, Norway, 28 May 1980. SCHRIFTEN DER BUNDESFORSCHUNGSANSTALT FUER FISCHEREI, vol. 16-17.

AQUACULTURE IN HEATED EFFLUENTS AND RECIRCULATION SYSTEMS. 1981, pp. 275-287.

Languages: English

Document Type: Conference; Book

ISBN: 3-87903-0553

ASFA Number: 113-10989

Abstract:

Herbivorous and omnivorous Amazonian fish were tested to determine their suitability for aquaculture. Pilot experiments in aquaria and tanks were carried out using two species. *Mylossoma* sp. showed the best growth rates (1.0% weight gain/day) with only 25% of the diet (30% protein) being of animal origin. *Colossoma macropomum* grew best (1.1% weight gain/day) on a diet with no animal protein. Data from feeding trials with *C. macropomum* and *Brycon* sp. are discussed. A water recycling system consisting of four suspended cloth ponds and a water treatment unit was used for feeding trials with *Brycon melanopterus*. Growth rates of fish fed on a commercial chicken diet (16.8% protein) are compared with those of fish given a standard ration (34% protein). During 120 feeding days, fish fed on the higher protein diet showed better growth rates (2.8% weight gain/day).

Descriptors: thermal aquaculture; growth; feed composition; recirculating systems

Geographic Descriptors: Brazil, Manaus

Taxonomic Descriptors: *Mylossoma*; *Colossoma macropomum*; *Brycon melanopterus*

Environment: Fresh

105

Aquaculture development in Rwanda. feasibility of small-scale rural fish farming.

Schmidt, U.W.; Vincke, M.M.J.

(FAO/UNDP Aquaculture Development and Coord. Programme, Rome (Italy))

Source: FAO/UNDP, ROME (ITALY), 1981, 69 pp.

Languages: English

Document Type: Book

Report No.: FAO ADCP/MR/81/12

ASFA Number: 113-14962

Abstract:

The present report discusses the technical, economic, social and financial feasibility of small-scale rural fish farming enterprises in Rwanda and the factors inhibiting higher productivity and expansion. It also indicates the nature and amount of inputs required to carry out an effective program of development aimed at a significant increase in supplies at acceptable costs.

Descriptors: freshwater aquaculture; fish culture; aquaculture development; economic analysis; sociological aspects;

Geographic Descriptors: Rwanda

Environment: Fresh

Identifiers: feasibility studies

106

The challenge and potential of aquaculture -- keynote address.

Scura, E.D.

(Aquatic Farms, Ltd., Kaneohe, HI, USA)

Source: 16. Annu. Meet. of the World Mariculture Society, Orlando, FL (USA), 13 January 1985.

J. WORLD MARICULT. SOC., (1986), vol. 16, pp. 6-15.

Languages: English

Document Type: Conference; Journal Article

ASFA Number: 117-15283

Abstract:

Abstracts of the 46 papers presented at the meeting are cited individually in this issue of ASFA.

Descriptors: marine aquaculture; aquaculture development; conferences; freshwater aquaculture

Environment: Marine

107

*The aquaculture potential of the two New Zealand species of freshwater crayfish *Paranephrops planifrons* and *P. zealandicus* (Parastacidae).*

Shaddick, M.

(Fish. Res. Div., Wellington, New Zealand)

Source: Presented at: Symp. on the Development and Utilization of Inland Fishery Resources, Colombo (Sri Lanka), 27 October 1976. Indo-Pacific Fisheries Council, Colombo (Sri Lanka). INDO-PACIFIC FISHERIES COUNCIL. PROCEEDINGS, 17TH SESSION, COLOMBO, SRI LANKA, 27 OCTOBER THROUGH 5 NOVEMBER 1976, SECTION 3. SYMPOSIUM ON THE DEVELOPMENT AND UTILIZATION OF INLAND FISHERY RESOURCES. FAO REGIONAL OFFICE FOR ASIA AND THE FAR EAST, BANGKOK (THAILAND). 1977, pp. 383-386.

Document Type: Conference; Book

ASFA Number: 109-01650

Abstract:

A market exists in Europe for large freshwater crayfish. New Zealand crayfish grow large enough, but are slow growing under natural conditions. Competitive aquaculture of these species must be intensive with a controlled environment. Growth in culture is related to temperature and water quality. Supplemental feeding is necessary, and a range of diets is being examined. Most growth in ponds takes place during summer. Females carry eggs throughout winter and juveniles become free-living in late spring. It is possible to remove and incubate eggs at higher temperatures and release juveniles in early spring to give an extended growing period in the first year. A 2-year growing period will be necessary to produce crayfish acceptable to export markets. One experimental farm produces 1-year crayfish for the domestic catering market. There is a wide range in ultimate size and growth rate in both species. Genetic factors appear to be at least as important as environmental ones. Selective breeding could have an impact on the success of any aquaculture venture.

Geographic Descriptors: New Zealand

Taxonomic Descriptors: *Paranephrops*

Environment: Fresh

Identifiers: aquaculture development; crustacean culture; growth; environmental conditions

108

On the culture-fishery potential of the Aligarh District.

Siddiqui, M.S.; Ahmad, Z.; Saxena, R.S.

(Zool. Dep. Aligarh Muslim Univ., Aligarh, India)

Source: INDIAN J. ECOL., 1978, vol. 5 (1), pp. 83-89.

Languages: English

Document Type: Journal Article

ASFA Number: 109-03432

Abstract:

A survey of the culture fishery of the Aligarh District revealed that the rearing of major carps *Catla catla*, *Cirrhina mrigala* and *Labeo rohita* had been undertaken in 38 freshwater ponds spread over 17 block areas of the district. Common carp, *Cyprinus carpio*, was also found in some ponds. Statistics of the rearing of carp fingerlings in the ponds are given from 1964 to 1976. It was found that the perennial ponds had a great potential of the culture fishery, provided these ponds were used for composite fish culture regularly and managed scientifically. The annual fish yield and growth from some cultivated waters have been discussed.

Descriptors: fish culture; aquaculture statistics; aquaculture development

Geographic Descriptors: India, Aligarh

Taxonomic Descriptors: Cyprinidae

Environment: Fresh

Identifiers: *Catla catla*; *Cirrhina mrigala*; *Labeo rohita*; *Cyprinus carpio*; aquaculture

109

Potential and constraints of small-scale freshwater fish culture enterprises in India.

Sinha, V.R.P.; Ranadhir, M.

(Freshwater Aquacult. Res. and Training Cent., Central Inland. Fish. Res. Inst., 624, Saheednagar, Bhubaneswar, Orissa, India)

Source: 19. Sess. Indo-Pacific Fishery Commission, Symposium on the Development and Management of Small-Scale Fisheries, Kyoto (Japan), 21 May 1980. PROCEEDINGS OF THE INDO-PACIFIC FISHERY COMMISSION. FAO Indo-Pacific Fishery Comm., Bangkok (Thailand), FAO Regional Office for Asia and the Pacific Bangkok (Thailand), 1980, pp. 526-538.

Languages: English

Document Type: Conference; Book

ASFA Number: 111-14618

Geographic Descriptors: India

Taxonomic Descriptors: Cyprinidae

Environment: Fresh

Identifiers: pond culture; freshwater aquaculture; Pisces

110

The role of aquaculture in feeding the world: Part I.

Slinger, J.

Source: THE MACDONALD JOURNAL, May 1985, vol. 46 (2), pp. 32-35.

Languages: English

Document Type: Journal Article

111

Social feasibility of coastal aquaculture.

Smith, I.R.; Pestano-Smith, R.

(ICLARM, Metro Manila, Philippines)

Source: ICLARM NEWSL., (1985), vol. 8 (3), pp. 6-8.

Languages: English

Document Type: Journal Article

ASFA Number: 117-13685

Abstract:

Issues related to assessing the social feasibility of technology for coastal aquaculture in the tropics are examined. Appropriate community-based aquaculture systems, community participation and coexistence with large-scale systems are discussed.

Descriptors: marine aquaculture; aquaculture development; sociological aspects

Environment: Marine; Brackish

112

Raising marketable yellow perch on a polychlorinated biphenyl contaminated diet: A feasibility study for the perch aquaculture industry.

Sommer, D.A.; Stuibler, D.A.; Bradley, R.L.; Peterson, R.E.

(Dep. Food Sci., Sch. Pharm., Univ. Wisconsin, Madison, WI 53706, USA)

Source: ARCH. ENV. CONTAM. TOXIC., 1982, vol. 11 (5), pp. 589-593.

Languages: English

Document Type: Journal Article

ASFA Number: 113-05768

Abstract:

The objective was to determine the feasibility of feeding yellow perch a (Perca flavescens) PCB-contaminated diet without exceeding 5 ppm in the fillet. To determine the extent to which the fillet (skeletal muscle and skin) accumulates PCB, assessment was made of whole body elimination and tissue distribution of a single PCB isomer (14 degrees C) 2,5,2',5'-tetrachlorobiphenyl (4-CB) in fingerling and adult perch exposed to a single oral dose of 0.8 μ g of (14 degree C) 4-CB. The significance of the findings is that the perch aquaculture industry may be able to feed lower cost PCB-contaminated diets and still harvest yellow perch fillets that meet U.S. Food and Drug Administration guidelines of 5 ppm for human food.

Descriptors: PCB; growth; metabolism; diets; aquaculture

Taxonomic Descriptors: Perca flavescens

Environment: Fresh

113

Marketing opportunities for aquaculture.

Spencer, S.N.

(Marketing Serv. Branch, Dep. Primary Ind., Brisbane, Qld., Australia)

Pollock, B.R.; Quinn, R.H. [eds.]

Source: Seminar on the Potential of Aquaculture in Queensland, Brisbane (Australia), 24-25 March 1983.
CONF. WORKSHOP SER. DEP. PRIMARY IND. (QUEENSL.), no. QC83012. THE POTENTIAL OF AQUACULTURE IN QUEENSLAND. PROCEEDINGS OF THE SEMINAR HELD AT THE PROFESSIONAL DEVELOPMENT CENTRE, BRISBANE, 24-25 MARCH 1983. 1984, pp. 199-205.

Languages: English

Document Type: Conference; Book

ASFA Number: 115-18488

Abstract:

While a detailed analysis of individual market opportunities for particular products will not be attempted, the paper will attempt to provide a broadbrush overview of markets currently available to the Australian seafood industry. The discussion will center on the characteristics of the market both locally and overseas and examine such critical factors as the marketing mix for seafoods, the controllable and uncontrollable factors in the market and issues such as supply-price relationships, market segmentation and the planning process. The paper is based on the premise that as with most other ventures in primary industry, too many resources are devoted to production technology with very little consideration being given to the real issues, that is--who will buy the product and at what price.

Descriptors: aquaculture; seafood; marketing

Geographic Descriptors: Australia

114

Habitat requirements of juvenile prawns.

Staples, D.J.

(CSIRO, Div. Fish. Res., Australia)

Pollock, B.R.; Quinn, R.H. [eds.]

Source: Seminar on the Potential of Aquaculture in Queensland, Brisbane (Australia), 24-25 March 1983.
CONF. WORKSHOP SER. DEP. PRIMARY IND. (QUEENSL.), no. QC83012. THE POTENTIAL OF AQUACULTURE IN QUEENSLAND. PROCEEDINGS OF THE SEMINAR HELD AT THE PROFESSIONAL DEVELOPMENT CENTRE, BRISBANE, 24-25 MARCH 1983. 1984, pp. 87-102.

Languages: English

Document Type: Conference; Book

ASFA Number: 115-18291

Abstract:

There are seven commercially important prawn species in Queensland, five species of the genus *Penaeus* and two species of the genus *Metapenaeus*. Total Queensland landings of these species in 1980/81 were at least 14,500 tonnes valued at approximately \$73 million. In terms of their habitat requirements while in the nursery areas (estuaries and bays) as well as their general ecology and behavior, the prawn species can be divided conveniently into three groups, the first being species in which the juveniles are associated with mangroves, the second requiring seagrasses (or similar rooted vegetation) with the last group being more catholic in their requirements. Any activities which will destroy the nursery area habitats will also affect prawn catches of the existing fisheries.

Descriptors: shrimp culture; nursery grounds

Geographic Descriptors: Australia, Queensland

Taxonomic Descriptors: *Penaeus*; *Metapenaeus*

Environment: Marine

115

The potential of tilapia in United States aquaculture.

Suffern, J.S.

Source: AQUACULT. MAG., 1980, vol. 6 (6), pp. 14-18.

Languages: English

Document Type: Journal Article

ASFA Number: 111-16906

Abstract:

This account briefly reviews the present status and potential of Tilapia culture in the USA.

Descriptors: fish culture; aquaculture development

Geographic Descriptors: USA

Taxonomic Descriptors: Tilapia

Environment: Fresh

Identifiers: freshwater aquaculture; historical account; Cichlidae; Pisces

116

Aquaculture of pearl spot (Etroplus suratensis) in an estuarine pond: environmental characteristics, primary production, growth and cost-benefit ratio.

Sumitra-Vijayaraghavan; Krishna Kumari, L.; Gopinathan, V.G.; Dhawan, R.M.

(Natl. Inst. Oceanogr., Dona Paula, Goa 403 004, India)

Source: INDIAN J. MAR. SCI., 1981, vol. 10 (1), pp. 82-89.

Languages: English

Document Type: Journal Article

ASFA Number: 111-15982

Abstract:

Fish production rate was worked out to be 437.5 kg/ha/yr. Cost of production was about Rs 3,300/ha and the rate of return on investment was 33%. In order to enhance the fish yield, use of fertilizers and incorporation of animal protein in the supplemented feed were suggested.

Descriptors: fish culture; brackish water aquaculture

Taxonomic Descriptors: Etroplus suratensis

Environment: Brackish

Identifiers: aquaculture systems; environmental factors; primary production; growth; cost analysis; Leiognathidae; Pisces

117

Ecological aspects of some Malaysian riverine cyprinids in relation to their aquaculture potential.

Tan, E.S.P.

(Sch. Biol. Sci., Science Univ. Malaysia, Minden, Penang, Malaysia)

Furtado, J. I. [ed.]

Source: 5. Int. Symp. of Tropical Ecology, Kuala Lumpur (Malaysia), 16 April 1979. TROPICAL ECOLOGY AND DEVELOPMENT. PROC. 5th INT. SYMP. TROP. ECOL., 16-21 APRIL 1979, KUALA LUMPUR, MALAYSIA. PT. 2. 1980, pp. 757-762.

Languages: English

Document Type: Conference; Book

ASFA Number: 113-19388

Abstract:

Some Malaysian riverine cyprinids (*Leptobarbus hoeveni*, *Tor tambroides*, *Acrossocheilus hexagonolepis*, *Probarbus jullieni*, *Puntius bulu* and *P. daruphani*) constitute an important fishery to rural riverine communities along the Pahang and Perak River systems. Studies indicate that habitat preferences shown by some of these omnivorous species are related primarily to their feeding and breeding habits. *T. tambroides* and *A. hexagonolepis* are commonly found in the upper reaches of the Pahang River system where *P. bulu* and *P. jullieni* are absent. The distribution of these species may be attributed to differences in the ecology of various parts of the river system. Preliminary observations indicate that some species can be cultured in ponds provided suitable feed is available. The formulation of a suitable feed, the maintenance of suitable water conditions and the availability of fish seed are critical for the introduction of these native species to the Malaysian aquaculture scene.

Descriptors: river fisheries; aquaculture development

Geographic Descriptors: ecology; Malaysia; fish culture

Taxonomic Descriptors: Cyprinidae

Environment: Marine

118

Die Aquakultur in der Bundesrepublik Deutschland gegenwaertiger Stand potentielle Bedeutung Entwicklungsmoeglichkeiten und Foerderung.

Aquaculture in the German Federal Republic its present status, potential importance, developmental possibilities and advancement.

Tiews, K.

(Bundesforschungsanst. Fisch., Inst. Kuesten-Binnenfisch., Hamburg, GFR

Tiews, K.; Mann, H. [eds.]

Source: Presented at: Deutscher Fischerei-Tag, Heiligenhafen (GFR), 16 September 1976.

DEUTSCHER FISCHEREI-VERBAND, HAMBURG (GFR), (no. 19), 1-20. FORTSCHRITTE IN DER AQUAKULTUR UND DIE BELASTUNG DER GEWAESSER DURCH INTENSIVZUCHT UND MASSNAHMEN ZU IHRER BEKAEMPFUNG. ADVANCES IN AQUACULTURE AND THE POLLUTION OF WATER BY INTENSIVE BREEDING AND THE MEASURES TO CONTROL IT.

DFV, Hamburg (GFR), 1976, 218 pp.

Document Type: Conference; Book

ASFA Number: 108-08412

Abstract:

The present status of West German aquaculture is described and the possibilities it offers for national and international fisheries are indicated. In the long term it is possible that certain species may be reared in natural waters and so ensure the production of food species.

Geographic Descriptors: Germany, Fed. Rep.

Environment: Marine; Fresh

Identifiers: aquaculture development; international cooperation; production (biological); recirculating systems

119

The potential for aquaculture of paua in New Zealand.

Tong, L.J.

(Fish. Res. Div., Minist. Agric. and Fish., Wellington, N.Z.)

Akroyd, J.M.; Murray, T.E.; Taylor, J.L. [comps.]

Source: Paua Fishery Workshop, Wellington (New Zealand), June 1982. OCCAS. PUBL. FISH. RES. DIV. MINIST. AGRIC. FISH. (N.Z.), no. 41. PROCEEDINGS OF THE PAUA FISHERY WORKSHOP. 1982, pp. 36-40.

Languages: English

Document Type: Conference; Book

ASFA Number: 114-14727

Abstract:

Aquaculture potential for paua (*Haliotis iris*) in New Zealand is considered. Paua breeding cycle, spawning control, settlement and postsettlement survival and juvenile growth are described. It is believed that the aquaculture of paua in New Zealand is biologically feasible, although economically some questions remain.

Descriptors: mollusk culture

Geographic Descriptors: PSE, New Zealand

Taxonomic Descriptors: *Haliotis iris*

Environment: Marine

120

Outline of research program for mariculture of bluefin tuna.

Uno, Y.; Yasuda, Y.; Masuda, T.; Taki, Y.; Walford, J.

(Tokyo Univ. Fish., 4-5-7 Konan, Minato-ku, Tokyo 108, Japan)

Source: Presented at: Working Group on Biology, Fisheries, and Potential Aquaculture of Mediterranean Tunas, Sctc (France), 9 May 1979. LE THON ROUGE EN MEDITERRANEE. BIOLOGIE PECHE ET AQUACULTURE, CNEXO PARIS (FRANCE), 1979, pp. 219-222.

Languages: English

Summary Languages: English; French

Document Type: Conference; Book

ASFA Number: 110-05180

Abstract:

In order to establish bluefin tuna (*Thunnus thynnus*) mariculture, it will be necessary to increase our knowledge of biology of this species. Research on mediterranean bluefin tuna is well advanced and it will be easy to develop further research programs. It will then be possible to decide on a rearing technique suitable to bluefin tuna. The main problems to be solved are: (1) the rearing of sexual products from mature fish caught at sea or by controlled reproduction of trapped tunas; (2) the rearing of larvae up to the juvenile stage and the study of their biological requirement. These juveniles will be used then either for culture in net cage or for restocking.

Taxonomic Descriptors: *Thunnus thynnus*

Environment: Marine

Identifiers: seeding (aquaculture); MED; rearing; life cycle

121

The potential of estuarine fish culture in Tanzania-biological aspects and problems.

Urasa, F.M.; Mainoya, J.R.

(Dep. Zool. Mar. Biol., P.O. Box 35064, Univ. Dar-es-Salaam, Tanzania)

Source: UNIV. SCI. J. DAR ES SALAAM., 1982, vol. 8 (1-2), pp. 54-65.

Languages: English

Document Type: Journal Article

ASFA Number: 115-16292

Abstract:

The aquaculture of freshwater fishes, e.g., *Tilapia* spp., is commonly practiced inland, but that of marine and estuarine fishes has yet to receive acceptance by the Tanzanian coastal communities. The introduction of an aquaculture based on brackish water and inshore marine fishes like the milkfish (*Chanos chanos*) mugilids (Mugil) and Siganids (*Siganus*) would seem possible and practical.

Descriptors: fish culture; aquaculture development; developing countries

Geographic Descriptors: ISW, Tanzania; brackish water aquaculture; estuaries

Taxonomic Descriptors: *Chanos chanos*; Mugil; *Siganus*

Environment: Marine; Brackish

122

Revue des sites potentiels pour l'aquaculture dans les eaux continentales tunisiennes.

(Review of potential aquaculture sites in Tunisian inland waters).

Vincke, M.M.J.

Source: ETUDE DU POTENTIEL AQUACOLE ET PROPOSITIONS POUR UNE POLITIQUE DE DEVELOPPEMENT DE L'AQUACULTURE EN TUNISIE. (STUDY ON AQUACULTURE POTENTIAL AND PROPOSALS FOR AN AQUACULTURE DEVELOPMENT POLICY IN TUNISIA. REPT. OF A TCP/ADCP MULTIDISCIPLINARY MISSION IN TUNISIA, MARCH-JUNE 1982.) 1983, pp. 173-205.

Languages: French

Document Type: Book

Report No.: FAO ADCP/MR/83/21

ASFA Number: 114-19124

Abstract:

An outline is given of the various sites that are suitable for aquaculture in Tunisia: 1) dams/reservoirs, 2) hill reservoirs, 3) small ponds, 4) salt lakes, 5) springs and oasis reservoirs, 6) artisanal wells/pumps. Recommendations are given for the following sites: dams/reservoirs, certain salt lakes and the wells of north Tunisia.

Descriptors: fish culture; freshwater aquaculture; site selection; brackish water aquaculture

Geographic Descriptors: Tunisia, Inland Waters

Environment: Brackish; Fresh

123

Water quality aspects of aquacultural projects.

Wallace, H.D.

(Water Quality Sect., Dep. Local Govern., Qld., Australia)

Pollock, B.R.; Quinn, R.H. [eds.]

Source: Seminar on the Potential of Aquaculture in Queensland, Brisbane (Australia), 24-25 March 1983.

CONF. WORKSHOP SER. DEP. PRIMARY IND. (QUEENSL.), no. QC83012. THE POTENTIAL OF AQUACULTURE IN QUEENSLAND. PROCEEDINGS OF THE SEMINAR HELD AT THE PROFESSIONAL DEVELOPMENT CENTRE, BRISBANE, 24-25 MARCH 1983. 1984, pp. 153-169.

Languages: English

Document Type: Conference; Numerical Data; Book

ASFA Number: 115-18066; 215-07942

Abstract:

Aquaculture can lead to the generation at certain times of the year of relatively large volumes of wastewater which can contain significant concentrations of pollutants resulting directly or indirectly from addition of chemicals and from metabolic products. Disposal of such wastewaters needs to be carefully considered if water pollution is to be avoided. Since in some situations this can become fairly expensive, the question of wastewater disposal needs to be taken fully into account in the early stages of site selection and economic assessment for any aquaculture project. This paper discusses the nature of aquaculture wastewaters and potential problems in their disposal and describes how various provisions of the Clean Waters Act (1971-1981) may relate to aquaculture projects.

Descriptors: aquaculture effluents; wastewater; water quality; pollution control

Geographic Descriptors: Australia

124

Potential for aquaculture development in New Zealand, with some observations on possible constraints.

Waugh, G.D.

(Fish. Res. Div., Minist. Agric. Fish., Wellington, N.Z.)

Dinamani, P.; Hickman, R.W. [comps.]

Source: Aquaculture Conference, Wellington (New Zealand), September 1979. OCCAS. PUBL. FISH. RES. DIV. MINIST. AGRIC. (N.Z.), no. 27. PROCEEDINGS OF THE AQUACULTURE CONFERENCE. 1980, pp. 7-11.

Languages: English

Document Type: Conference; Book

ASFA Number: 113-14863

Abstract:

The practice of aquaculture in New Zealand is discussed with relevance to its development as an industry. The categories involved in this development include: 1) raising young fish for release into the sea or the seeding of shellfish beds to increase the size of natural populations, 2) capture and confinement of young fish or shellfish in growing areas, 3) rearing of young hatched from eggs stripped from captive adults and growing-on to market size, and 4) selection of progeny and development of domesticated strains adapted to the particular environment or market. The potential of mollusks, crustaceans, freshwater culture and seaweeds is considered.

Descriptors: aquaculture development; mollusk culture; crustacean culture; seaweed culture; fish culture

Geographic Descriptors: New Zealand

Environment: Marine; Fresh

125

A goldmine in fish food.

Weber, S.J.; Manheim, F.T.

Source: Chemical Week: Technology Newsletter, April 15, 1989, p. 17

Languages: English

Document Type: Newspaper Article

Descriptors: seafood; aquaculture vaccines; aquaculture hormones; sales; statistics

126

The economics of fish culture. A survey of costs associated with tilapia (Sarotherodon mossambicus) production.

Wright, N.A.; Kenmuir, D.H.S.

(Farm Management Research Bureau, Ministry of Agriculture, Zimbabwe)

Source: ZIMBABWE AGRIC. J., (1981), vol. 78 (4), pp. 151-165.

Languages: English

Document Type: Journal Article

ASFA Number: 112-15730; 113-05999

Abstract:

The object of this paper is to provide farmers in Zimbabwe with a budgetary aid which can be used to appraise the economic viability of *Sarotherodon mossambicus* production. A general dearth of literature on the pond culture of fish in Zimbabwe has led to many farmers failing to realize the economic potential of this type of enterprise. It is hoped, therefore, that the paper will make a contribution towards correcting this anomaly. A hypothetical cost production model for the culture of *S. mossambicus* is constructed from physical input-output relationships determined by the current state of scientific and technical knowledge.

Descriptors: feasibility studies; fish culture; cost analysis

Geographic Descriptors: Zimbabwe

Taxonomic Descriptors: *Sarotherodon mossambicus*

Environment: Fresh

127

An experimental assessment of the aquaculture potential of the brown mussel, Modiolus metcalfei.

Yap, W.G.

Source: Q. Res. Rep. Aquacult. Dep. Southeast Asian Fish. Dev. Cent., (1978), vol. 2 (2), pp. 19-23.

Languages: English

Document Type: Journal Article

ASFA Number: 110-16976

Abstract:

A study was conducted at Banate Bay, Iloilo, from November 1975 to March 1976. Trials were conducted using spat collectors of four types, but no *Modiolus metcalfei* spat settled on any of the experimental collectors during the entire study period. Instead they attached to the exposed posterior half of the living *Modiolus* collected for reproductive cycle studies. The aquaculture potential of the brown mussel is considered to be low. Improvement of its production potential should be approached along the line of resource management rather than aquaculture. This management should be aimed at

Abstract (cont.):

two objectives: (1) maintenance of enough adults on settlement surfaces, and (2) provision of space to allow new recruitments to grow. A possible solution, therefore, is controlled harvesting or thinning after the peak in the settlement season. In this manner, the chances of the mussel bed recovering year after year may be enhanced.

Descriptors: aquaculture development; potential resources

Geographic Descriptors: ISEW, Philippines

Taxonomic Descriptors: *Modiolus metcalfei*

Environment: Marine

Identifiers: marine aquaculture; mollusk culture; Bivalvia; resource management

128

Settlement preference of the brown mussel, Modiolus metcalfei, Hanley and its implication on the aquaculture potential of the species.

Yap, W.G.

Source: Fish. Res. J. Philipp., (1979), vol. 3 (1), pp. 65-70.

Languages: English

Document Type: Journal Article

ASFA Number: 110-11131

Abstract:

A study on the settlement preference of *M. metcalfei* was made in Banate Bay, Iloilo, using four types of materials as spat collectors. During the 6-month study period, not a single *Modiolus* spat was found in any of the materials tested. Spats were found attached to the posterior half of living adult mussels collected for related studies. Tests with empty *Modiolus* shells and bamboo fish corrals as spat collectors showed negative results indicating that settlement response in the brown mussel is elicited by the presence of living animals.

Descriptors: aquaculture development; mollusk culture; substrate preferences; seed collection

Taxonomic Descriptors: *Modiolus metcalfei*

Environment: Marine

Identifiers: potential yield; marine aquaculture; settlement (biological); ISEW, Philippines; Bivalvia

Author Index

(by page)

Ahmad, Z.	59	Harada, T.	24
Akroyd, J.	64	Harvey, D.	20
Annett, W.	8	Haxby, R.	24
Arshad, N.	8	Haysom, N.	25
Azzouz, A.	9	Hechanova, R.	26
Balarin, J.	9, 10	Heggelund, P.	27
Barclay, W.	10	Henderson, S.	27
Bard, F.	11	Hershberger, W.	27
Barnabe, G.	11	Hickman, R.	15, 55, 66
Beales, R.	40	Higman, J.	24
Berg, L.	45	Hill, B.	28
Bilio, M.	55	Hirasawa, Y.	29
Binkowski, F.	12	Hirigoyen, J.	29
Bjoerndal, T.	13	Hougart, B.	30
Bloom, B.	13	Inoue, M.	30
Bradley, R.	60	Ishida, Y.	31
Brown, R.	13	Israel, D.	31
Bryan, D.	13	Iwamoto, R.	27
Campbell, G.	14	Jegou, A.	19, 42
Carroll, P.	15	Jenkins, D.	41
Carruthers, A.	15	Jewel, K.	32
Chan, F.	16	Ji, L.	32
Chang, S.	39	Jones, J.	33
Chavez Lomeli, M.	16	Kapetsky, J.	22, 44
Chua, T.	17	Karpevich, A.	33
Chutiyaputta, K.	17	Kearney, R.	34
Collier, W.	8, 16, 17	Kenmuir, D.	67
Costa-Pierce, B.	18	King, D.	34
Couteaux, B.	19, 42	Kinne, O.	35
Credlin, B.	19	Kirk, R.	36
Currie, D.	40	Krishna Kumari, L.	62
Cuzon, G.	20	Kuhnhold, W.	22
Dhawan, R.	62	Lawrie, S.	36
Dicks, M.	20	Le Gall, J.	37
Dinamani, P.	15, 55, 66	Lee, A.	36
Doroshov, S.	12	Leglise, M.	37
FAO/UNDP	20, 21	Leighton, D.	38
Felix, S.	21	Liao, D.	38, 39
Fishelson, L.	39	Liao, I.	39
Furtado, J.	62	Librero, A.	8, 16, 17
Gedney, R.	22	Lindley, R.	40
Gilmour, J.	22	MacKinnon, M.	41
Goebel, R.	10	Mainoya, J.	65
Gopinathan, V.	62	Maitland, P.	41
Green, D.	23	Manheim, F.	67
Grobbelaar, J.	23	Mann, H.	63
Guerrero, R.	21	Masuda, T.	64
Haesman, M.	25	Mattheeuws, A.	16

Author Index

(by page)

Melteff, B.	27	Rothlisberg, P.	55
Merceron, M.	19, 42	Saint-Paul, U.	56, 57
Moeller, D.	42	Saxena, R.	59
Mohanty, S.	43	Saxton, A.	27
Moore, S.	22	Say Pui Yen, A.	16
Morrissy, N.	43	Schmidt, U.	57
Msiska, O.	44	Schoonbee, H.	52
Muir, J.	45	Scura, E.	58
Munoz Esquerria, J.	45	Shaddick, M.	58
Murillo, A.	46	Shearer, W.	41
Murray, T.	64	Siddiqui, M.	59
Muthu, M.	46	Sindermann, C.	55
Nagle, N.	10	Sinha, V.	59
Nash, C.	47	Skarlato, O.	33
Neve, R.	27	Slinger, J.	59
New, M.	54	Smith, I.	60
Newkirk, G.	47	Soesanto, V.	21
Noel, S.	42, 53	Sokolov, V.	33
O'Connor, J.	47	Sommer, D.	60
Olsen, H.	48	Spencer, C.	34
Olsen, S.	48	Spencer, S.	60
Parsons, P.	50	Staples, D.	61
Pashen, A.	49	Stuiber, D.	60
Pepper, V.	50	Suffern, J.	62
Perex Vega, M.	16	Sumitra-Vijayaraghavan	62
Perez Mendoza, M.	50	Taki, Y.	64
Pestano-Smith, R.	60	Tan, E.	62
Petel, C.	29	Taylor, J.	64
Peterson, R.	60	Terry, K.	10
Phleger, C.	38	Thacker, G.	53
Piriou, J.	19, 42	Tiensongrusmee, B.	26
Pollock, B.	13, 14, 19, 22, 25, 28, 36, 41, 47, 48, 49, 51, 52, 55, 60, 61, 66	Tiews, K.	57, 63
Potter, M.	52	Tong, L.	64
Prinsloo, J.	52	Uno, Y.	64
Purdom, C.	53	Urasa, F.	65
Quinn, R.	13, 14, 19, 22, 25, 28, 36, 41, 47, 48, 49, 51, 52, 55, 60, 61, 66	Vincke, M.	57, 65
Rabanal, H.	54	Walford, J.	64
Raguenes, G.	37	Wallace, H.	66
Ramsaroop, D.	54	Waugh, G.	66
Ranadhir, M.	59	Weber, S.	67
Ravagnan, G.	55	Weissman, J.	10
Ritchie, L.	55	Werder, U.	57
Rivkin, M.	34	Wright, N.	67
Rosenthal, H.	55	Yap, W.	67, 68
		Yaron, Z.	39
		Yasuda, Y.	64

Subject Index

(by page)

- abalone 48, 49
- Acipenser 12
- algae 10, 14, 23, 24
- Aligarh 59
- Arapaima gigas 56
- Aristichthys nobilis 27, 52, 53
- Atlantic 11, 12
- Atlantic salmon 41, 50
- Australia . . . 13, 14, 15, 19, 20, 22, 23, 25, 26, 28, 36,
 . 37, 41, 43, 44, 47, 48, 49, 51, 52, 55, 56, 60, 61, 66
- Auxis tapeinosoma 24
- Auxis thazard 24
- Bahamas 24, 25
- baitfish 34
- barramundi 41, 51
- brackish 7, 8, 14, 18, 21, 22, 26, 28, 34, 39,
 40, 41, 43, 46, 47, 48, 51, 55, 60, 62, 65
- brackish water 7, 8, 18, 21, 26, 39, 40,
 41, 43, 46, 48, 51, 55, 62, 65
- Brazil 57
- breeding 15, 28, 47, 58, 63, 64
- British Isles 41, 53
- Brittany 19
- brood stock 28
- Brunei 40
- Brycon gautemadensis 17
- Brycon melanopterus 57
- cage culture 7, 14, 17, 22, 28, 32
- California 38
- Canada 13, 39, 47, 50
- Caribbean 24, 54
- carp 15, 18, 27, 52, 59
- catfish 13, 27
- Catla catla 59
- Chanos chanos 65
- Cherax destructor 15
- Cherax tenuimanus 43, 44
- Chile 13
- Chrysichthys walkeri 29
- Cichlasoma 17
- Cirrhina mrigala 59
- coastal aquaculture 7, 22, 46, 55, 60
- Colossoma 56
- Colossoma macropomum 57
- commercial 9, 13, 20, 25, 28, 34,
 36, 37, 39, 44, 46, 47, 49, 56, 57
- Congo 9
- construction . . . 7, 10, 17, 20, 22, 26, 44, 46, 49, 50
- consumption 23, 46
- crab 28
- crawfish 39
- crayfish 14, 15, 33, 39, 58
- crustacean 8, 15, 26, 32, 33, 43, 44, 53, 58, 66
- Ctenopharyngodon idella 52, 53
- Culaca inconstans 35
- Cyprinus carpio 18, 44, 53, 59
- diet 28, 35, 38, 46, 57, 58, 60
- disease(s) 14, 15, 28, 32, 46, 52
- East Coast 39
- economic(s) 8, 10, 13, 14, 16, 17, 18, 20,
 22, 26, 29, 31, 32, 33, 34, 36, 38,
 39, 42, 44, 46, 48, 49, 50, 57, 66, 67
- economy 15, 16, 44
- Ecuador 55, 56
- effluents 57, 66
- Etroplus suratensis 62
- Europe 36, 58
- export 23, 58
- extensive 14, 18, 55, 56
- feasibility 7, 9, 10, 18, 20, 29, 30, 31,
 34, 39, 40, 45, 52, 53, 57, 60, 67
- feeds 26, 32, 44
- feedstuffs 13, 30
- financing 26, 36, 37
- fishpen 21, 22
- flatfish 55
- food conversion 26
- France 11, 19, 24, 29, 30, 31, 37, 38, 42, 64
- genetics 12, 27, 28, 47, 58
- geothermal 32
- Germany, Federal Republic of 63
- Haliotis iris 64
- Haliotis kamtschatkana 48, 49
- hatcheries . . . 11, 26, 28, 30, 31, 45, 47, 49, 53, 54, 56
- Hawaii 18
- Hinnites multirugosus 38, 48, 49
- history 12, 14, 26, 29, 30, 36
- hydraulic 45
- Hypophthalmichthys molitrix 15, 16, 18, 27, 52, 53
- Ictalurus punctatus 27
- Idaho 32
- import 10, 21, 23, 40
- India 43, 46, 59, 62
- integrated aquaculture 18, 52
- intensive 9, 14, 20, 42, 45, 56, 58, 63
- Ivory Coast 29

Subject Index

(by page)

- Japan 24, 29, 31, 55, 56, 59, 64
 Jordan 30
 Katsuwonus pelamis 34
 kingfish, northern 55
 Labeo rohita 59
 Languedoc 11
 large-scale 21, 32, 40, 48, 56, 60
 Lates calcarifer 41
 legislation 23, 25, 28, 37, 48
 Libya 45
 license 25
 mackerel 24, 31
 Macrobrachium rosenbergii 18, 49, 54
 Malawi 44
 Malaysia 7, 8, 9, 17, 18, 22, 26, 32, 62, 63
 market(s) 13, 14, 15, 21, 22, 29, 30, 33, 38,
 39, 45, 46, 49, 54, 56, 58, 60, 61, 66
 marron 43, 44
 mathematical models 24
 Mediterranean Sea 37
 Metapenaeus 61
 Mexico 12, 16, 17, 45, 50
 Michigan 34, 35
 microalgae 10
 Micropterus salmoides 35
 milkfish 65
 Modiolus metcalfei 67, 68
 mollusk 18, 47, 49, 52, 53, 64, 66, 68
 Morone chrysops 39
 Morone saxatilis 39
 Mugil 65
 Mugil cephalus 18
 Mugil curema 46
 mullet 18, 51, 55
 mussel 40, 67, 68
 Mylossoma 57
 net cage(s) 24, 64
 net-pen 27, 28
 New Zealand 15, 16, 33, 55, 58, 64, 66
 Newfoundland 50
 North America 12, 36
 Norway 13, 42, 57
 Oreochromis 40
 Orissa 43, 59
 output 13, 42, 67
 oyster 38, 52, 53
 Paranephrops 33, 58
 Pecten caurinus 48, 49
 pen 17, 22, 28, 32
 penaeid 24, 25, 26, 55, 56
 Penaeidae 25, 26, 46, 56
 Penaeus 29, 61
 Perca flavescens 60
 perch 60
 permit 25
 Perna viridis 40
 Philippines 8, 16, 17, 18, 21, 22, 26, 31, 54, 60, 68
 Pimephales promelas 35
 Pinctada maxima 52
 policy 13, 16, 17, 18, 21, 23, 25, 65
 polyculture 18, 21, 27, 32, 43, 44, 52
 pond culture 14, 22, 26, 32, 44, 46, 59, 63, 67
 pond(s) 27, 34, 62
 prawn(s) 15, 18, 25, 26, 32, 45, 46, 49, 54, 56, 61
 Procambarus clarkii 39
 proposal 14, 21, 36, 37, 48, 65
 Puget Sound 28
 Queensland 13, 14, 19, 20, 22, 23, 25, 28, 36,
 37, 41, 47, 48, 49, 51, 52, 56, 61, 66
 raceway 10, 45
 ranching 41
 recirculating systems 57, 63
 recirculation systems 57
 regulations 13, 23, 25, 37, 45, 46, 48
 reproduction 12, 16, 29, 31, 42, 64
 Rwanda 57
 Saccostrea 52
 Salmo salar 41, 50
 salmon 13, 27, 28, 41, 50
 Sarotherodon 44
 Sarotherodon mossambicus 67
 Saudi Arabia 10
 scallop 14, 38, 48, 49
 Scaphirhynchus 12
 Scombrus thynnus 11
 Scotland 13, 41
 Scylla serrata 28
 sea bream 31, 40, 45
 seabass 45
 seafood 13, 23, 61, 67
 seaweed 38, 66
 seed production 8, 32
 seeding 14, 64, 66
 semi-intensive 26, 56
 shellfish 13, 14, 25, 38, 48, 49, 53, 66
 shrimp(s) 18, 20, 24, 25, 26, 29, 43, 46, 54, 56, 61

Subject Index

(by page)

Siganus	65	Thunnus albacares	24
Singapore	16, 40	Thunnus thynnus	11, 24, 29, 37, 64
site selection	17, 22, 38, 42, 43, 45, 46, 50, 65, 66	tilapia	9, 10, 32, 39, 40, 44, 45, 54, 62, 65, 67
sites	8, 17, 19, 20, 22, 25, 26, 30, 37, 38, 40, 42, 65	Tobago	54
small-scale	7, 21, 22, 57, 59	training	7, 8, 20, 22, 45, 46, 59
snapper	55	Trinidad	54
South Africa	23, 52, 53	tuna	11, 24, 29, 30, 31, 37, 64
South America	56	Tunisia	9, 21, 65
South Carolina	38, 39	United Arab Emirates	20
South Pacific	34	United States	13, 23, 62
spawning	11, 15, 27, 32, 49, 50, 64	Washington	20, 27, 28, 30, 47, 48, 49
Sri Lanka	7, 8, 32, 58	wastewater	18, 23, 34, 35, 66
statistics	13, 59, 67	water quality	15, 27, 38, 51, 58, 66
stock assessment	31	weathervane	48, 49
stocking	7, 9, 15, 19, 26, 30, 31, 32, 41, 44, 56, 64	West Coast	48
sturgeon	12	yabbie	15
Tabasco	16, 17	yellowtail	31
tank(s)	10, 20, 24, 57	Zambia	20, 21
Tanzania	65	Zawia	45
Thailand	7, 8, 17, 18, 32, 41, 54, 58, 59	Zimbabwe	67





